

**MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS
INFORMATION AND SUPPLEMENTARY
OPERATING, MAINTENANCE AND
REPAIR PARTS INSTRUCTIONS)**

**ROLLER MOTORIZED,
STEEL WHEEL 2 DRUM
TANDEM
TON
HYSTER MC
NSN 3895**

**HEADQUARTERS, DEPARTMENT OF THE ARMY
MARCH 19**

- WARNING:** Always use extreme caution when positioning scrapers as they are under considerable spring tension and may become sharp when worn.
- WARNING:** Always support ballast securely when removing or installing ballast mounting capscrews.
- WARNING:** In order to check the high-pressure relief valve, it is necessary to bring the unit to stall. **CAUTION** must be taken to ensure the safety of personnel when attempting to stall the unit.
- WARNING:** Changing the quantity of shims in the relief valves is not recommended.
- WARNING:** When adjusting the Displacement Control Valve, the drive drum must be safely blocked off the ground. Any movement of the Control Valve Spool causes the unit to shift out of neutral and the drum will turn. **CAUTION** personnel to stand clear of the drive drum.
- WARNING:** The brake assembly will be removed prior to drive drum removal. Block the machine safely to prevent movement.
- WARNING:** When removing the drive drum, take caution. The drive drum is extremely heavy (approximately 12,000 lb., 5440 kg without ballast). **CAUTION** personnel to stand clear.
- WARNING:** During transmission start-up procedure, disconnect the cable from the pump until after initial start-up. This will allow the pump to remain in neutral (see figure 7-104).
- WARNING:** Connect the drum hub to a hoist before removal from the drive drum. The outer planetary assembly will accompany the drum hub upon removal. Care should be taken when handling these components.
- WARNING:** When assembling the steering control unit, alignment of the cross slot in the drive with the valleys between the teeth of the meter gear star determines proper valve timing of the unit. There are 12 teeth on the spline and 6 pump teeth on the star. Alignment is exactly right in 6 positions and exactly wrong in 6 positions. If the parts slip out of position during this part of assembly, repeat until you are certain correct alignment is obtained (see figure 9-57).

sensored. If the steering control unit has been disassembled and incorrectly timed, the steering wheel may suddenly become motorized or rotate abruptly with extreme force. If this occurs, see figure 9-2 and paragraph 9-27, step 1 and retune the control unit as shown.

WARNING: When checking water spray motor brushes, be sure ignition key switch and water spray switch are in the OFF position before inspecting brushes.

WARNING: Support heavy components securely BEFORE attempting to remove them.

WARNING: Always block the unit securely to prevent movement while performing maintenance or repairs.

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT,
GENERAL SUPPORT, AND DEPOT MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS INFORMATION AND SUPPLEMENTAL
OPERATING, MAINTENANCE AND REPAIR PARTS INSTRUCTIONS)
ROLLER MOTORIZED, STEEL WHEEL 2 DRUM
Tandem 10-14 TON (CCE)
HYSTER MODEL C350B-D
NSN 3895-00-578-0372
CONTRACT NO. DSA700-74-C-9024

REPORTING OF ERRORS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Tank-Automotive Materiel Readiness Command, ATTN: DRSTA-MBS, Warren, MI 48090. A reply will be furnished to you.

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This technical manual is an authentication of the manufacturers' commercial literature and does not conform with the format and content specified in AR 310-3, Military Publications. This technical manual does, however, contain available information that is essential to the operation and maintenance of the equipment.

SERVICE MANUAL

STEEL WHEEL ROLLER C350B
CONTRACT NO. DSA 700-74-C-9024

C350B STEEL WHEEL ROLLER

Starting

1. Set park brake.
2. Move throttle bail to neutral (vertical position).
3. Start engine.
4. *To Protect Engine and Transmission:*
Do not operate above half throttle until transmission temperature is over 100°F.

Operating

1. Release park brake.
2. Direction and speed are controlled by bail. Machine will travel in direction bail is moved. Additional bail movement increases speed.
3. To prevent lugging engine on an upgrade move bail back towards neutral position.
4. Use emergency stop, identified on dash in red, only if engine speed cannot be controlled.

Stopping

1. Put throttle bail in neutral (vertical position).
2. Set park brake.
3. Turn ignition switch to off position.

Do not Tow - In case of machine malfunction, vehicle may be moved at slow speed by opening transmission by-pass valve. This is done by pulling up and locking the control located under the hood on the hydraulic tank side of the unit.

FOR SAFETY

TRAINED OPERATOR ONLY

1. Use slower speed and added caution when operating close to fill edge and when traveling downhill.
2. Travel up and down the grade when operating on slopes.
3. Report damage and faulty operation immediately, do not operate machine until corrected.
4. Always set park brake before getting off machine. Transmission will not hold parked machine on a grade.
5. Follow the operating instructions above and in the owners and operators manual.
Extra copies available from your Hyster dealer.

Notwithstanding the provisions of Clause 5 of the General Provisions, entitled "Inspection", the Contractor guarantees that, at the time of delivery thereof, the supplies provided for under this contract will be free from defects in material or workmanship and will conform to the requirements set forth in the contract. Notice of any alleged defect or non-conformance shall be given by the Government to the Contractor within one (1) year following delivery of the allegedly defective or non-conforming item. The Contractor shall be afforded the opportunity to examine the allegedly defective or non-conforming supplies, or parts thereof, at the site at which the suspected malfunction is experienced or, if field examination cannot be accomplished, such allegedly defective or non-conforming supplies, or parts thereof, shall be returned freight collect via cheapest transportation to the Contractor's plant. The Contractor shall with all possible speed, exchange such supplies, or parts thereof, with supplies or parts of like kind and ship such supplies or parts thereof freight prepaid to the location from which the defective or non-conforming supplies or parts thereof were returned or, if such location is not within CONUS, to the port of embarkation or other location within the original 48 States or the District of Columbia prescribed by the Contracting Officer, provided examination of such supplies or parts thereof discloses to the Contractor's satisfaction that the material received (a) was defective or non-conforming when delivered, or (b) has become defective or non-conforming since delivery for reasons other than as a result of having been (1) improperly repaired, altered or subjected to misuse, negligence, accident, or lack of normal maintenance services, or (2) operated at load factors which, although consistent with the user's duty cycle requirements, are in excess of Detroit Diesel Allison's published commercial ratings for the product. This Guaranty shall then continue as to any such exchange supplies or parts thereof until one (1) year after the date of delivery thereof.

Notwithstanding the foregoing, the Contractor's total liability for transportation charges shall not exceed the cost of transporting the allegedly defective or non-conforming supplies, or parts thereof, by the usual commercial surface method of shipment, from the shipping destination originally specified under this contract for the applicable CLIN to the Contractor's plant and return, and the Government shall reimburse the Contractor for all transportation expense in excess of such amount upon request.

If the Government does not require the exchange of any supplies, or parts thereof, agreed to be defective or non-conforming, the Contractor, if required by the Contracting Officer within a reasonable time after notice of the defect or non-conformance, shall repay such portion of the contract price for the supplies as is equitable in the circumstances and comparable to the price(s) at which the Contractor then offers the exchanged supplies, or parts thereof, for sale to the Government.

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1-2. This manual contains Operation and Maintenance Instructions for the C350B Steel Wheel Roller (figure 1-3 and 1-4). Operating instructions must be carefully reviewed and understood before attempting to operate a unit. The individual assigned to operate the unit should see that it is kept in good condition to ensure prolonged efficiency.

1-3. UNIT NAMEPLATE.

1-4. The unit nameplate is located at the front of the operator's compartment as shown in figure 1-4. Make sure the nameplate remains attached to the unit at all times.

NOTE: Make sure that nameplate information is complete. If not, contact a Hyster Dealer.

1-5. SERIAL NUMBER DATA (see figure 1-4).

CAUTION: The COMPLETE serial number must be identified when ordering parts or communicating service information to Hyster Company.

unit nameplate. It is also stamped on the left hand side of the gooseneck. The serial number indicates the design series, manufacturing plant, serial number of the unit and year manufactured, Example: B89 C 0000 T.

1-7. SYSTEM DESIGN SPECIFICATIONS.

1-8. Design specifications for individual systems of the unit are listed in Section 2. Maintenance Specifications are given in Section 4.

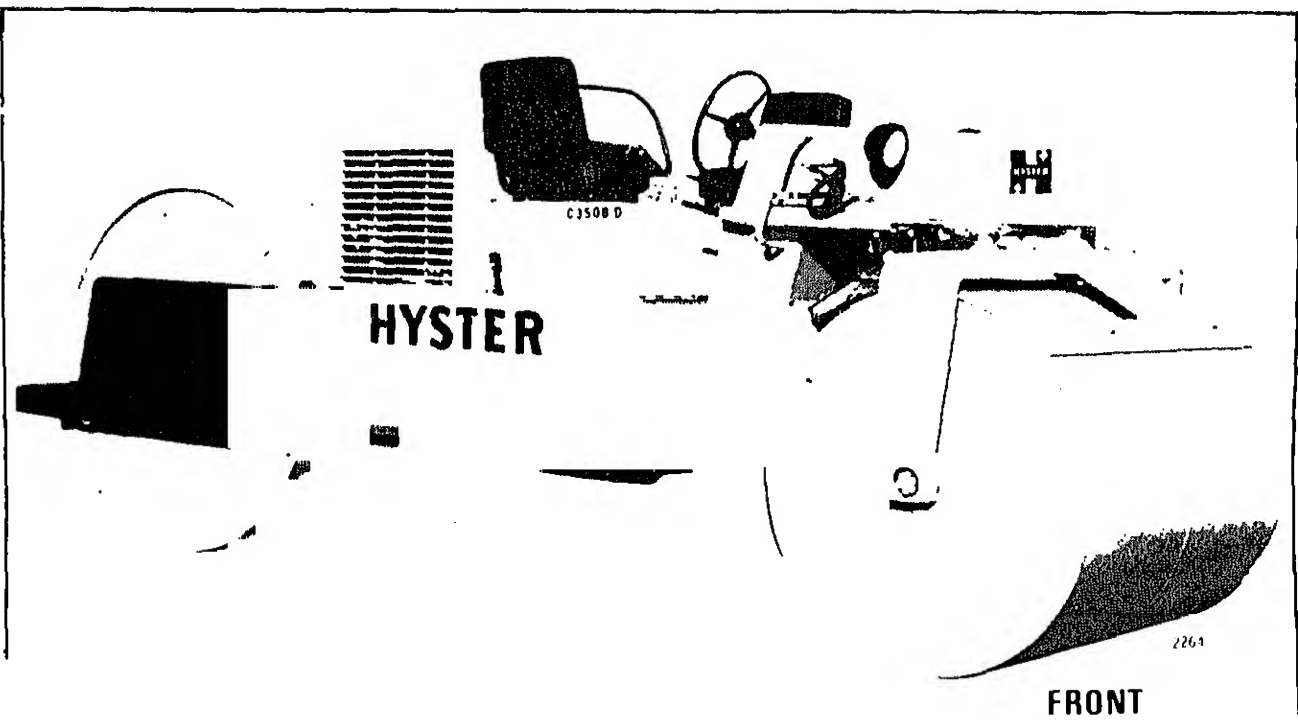
1-9. OPERATING INSTRUCTIONS.

1-10. All instructions necessary for safe and efficient operation are given in Section 3.

1-11. HYSTER—CARE MAINTENANCE.

1-12. Section 4 contains the schedule and procedures required for proper maintenance. The schedule lists recommended time intervals between maintenance checks. The procedures provide detailed instructions for performing maintenance checks.

1-13. TROUBLESHOOTING.



Section 5 of this publication.

1-15. SYSTEM DESCRIPTIONS AND REPAIRS.

1-16. Refer to C350B Service Manual.

1-18. When operating the unit, always observe recommended procedures given on the inside front cover of this manual.

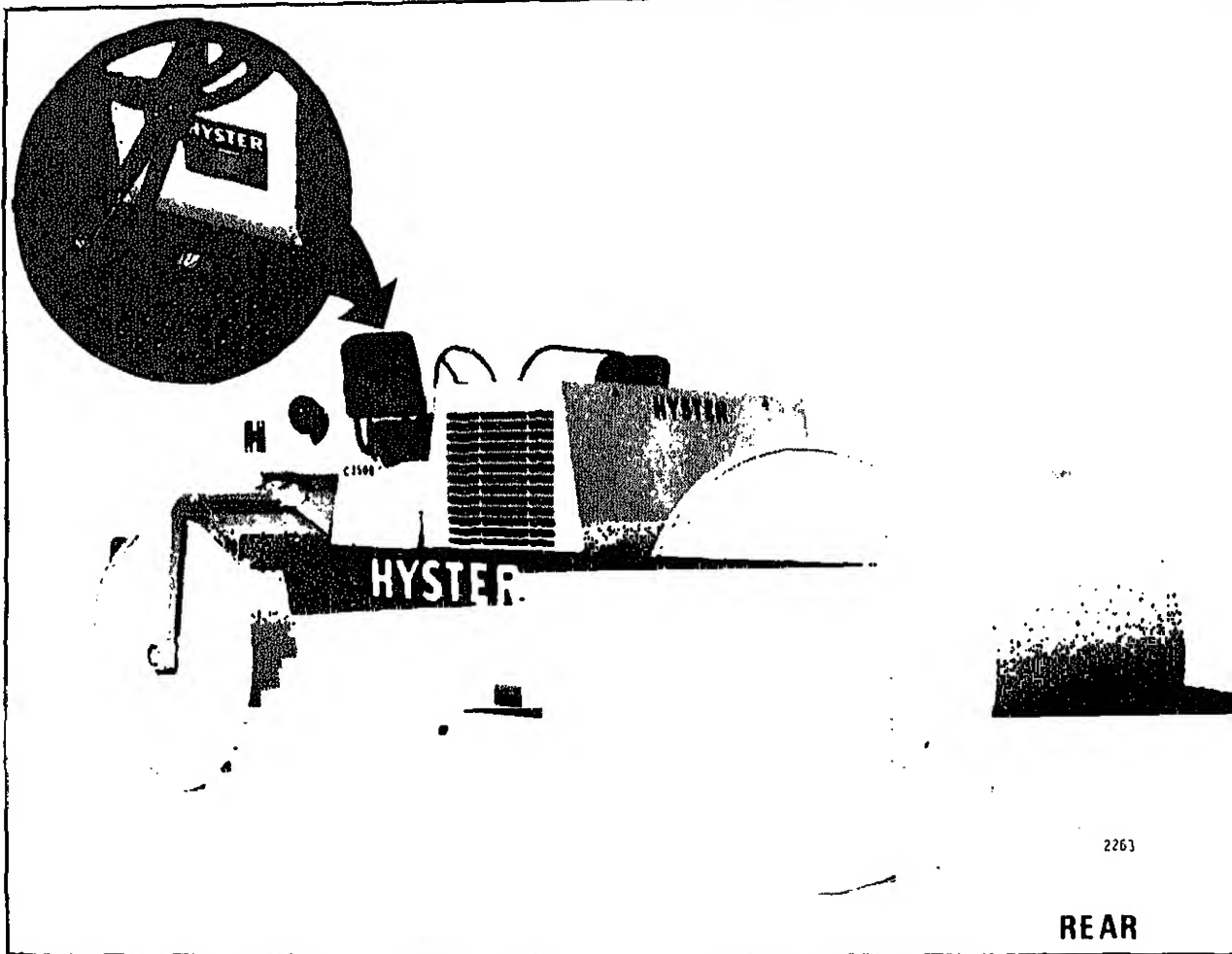


FIGURE 1-4.

2-2. This section contains specification tables for each major system of the compactor.

unit dimensions, weight, performance and Following is a list of specification tables included in this section:

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2-1	Compactor Dimensions
2-2	Performance Specifications
2-3	Weight, Ballast Compression Data
2-6	Detroit Diesel Engine Specifications
2-7	Water Spray System Specifications
2-8	Hydrostatic Transmission Specifications
2-9	Final Drive and Drum Assembly Specifications
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TABLE 2-1. COMPACTOR DIMENSIONS (see figure 2-1).

ITEM	DESIGN DATA	
	C350B	
	INCH	(cm)
A. Overall Height	77	(196)
B. Overall Length	197	(500)
C. Overall Width	65	(165)
D. Ground Clearance	18	(46)
10-14 Ton C350B	15	(38)
E. Wheelbase	140	(356)
F. Guide Roll Width	54	(137)
G. Guide Roll Diameter	48	(122)
H. Drive Roll Diameter	60	(152)
I. Drive Roll Width	54	(137)
J. Guide Roll Maximum Oscillation		
Going Straight		25° From Level on Each Side
In Full Turn		10° From Level on Each Side
K. Guide Roll Maximum Turn		90° Total (45° Each Side)

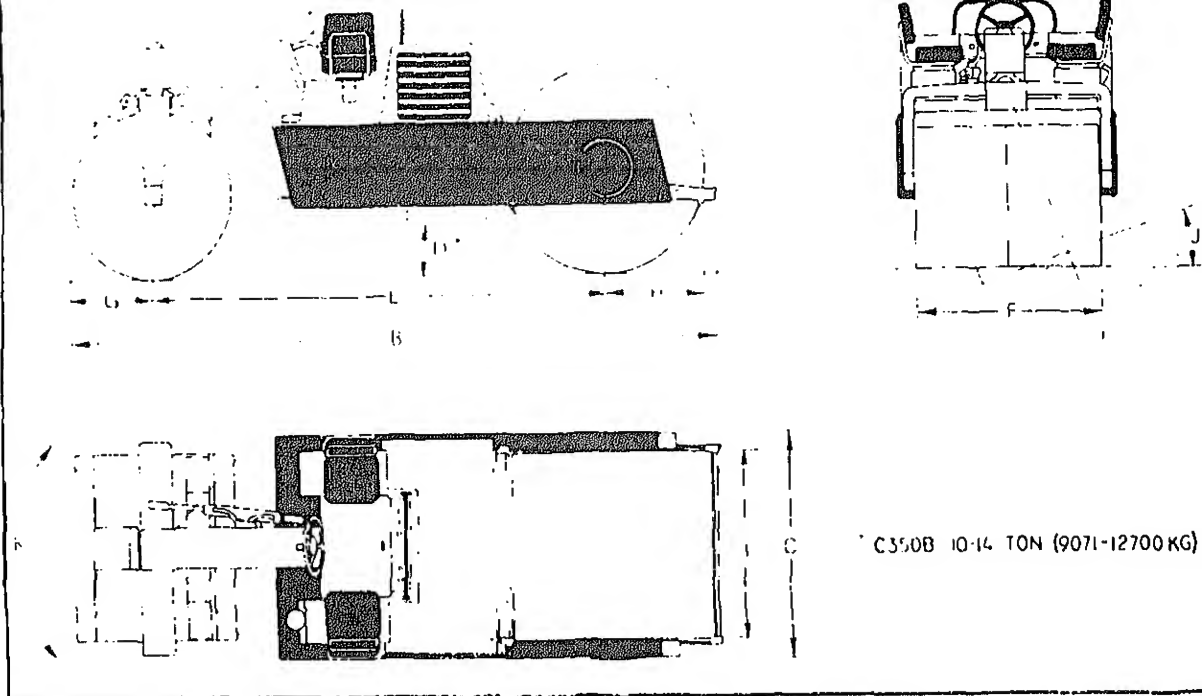


FIGURE 2-1.

TABLE 2-2. PERFORMANCE SPECIFICATIONS.

ITEM	DESIGN DATA	
	C350B	
Maximum Travel Speed	8 MPH (12.9 km/h)	
Inside Turning Radius	10 ft (3.0 m)	
Outside Turning Radius	13 ft (4.0 m)	

TABLE 2-3. WEIGHT, BALLAST COMPRESSION DATA.

ITEM	DESIGN DATA			
	WITHOUT BALLAST			
	Weight		Compression	
	lb	(kg)	lb/lineal inch	(kg/lineal cm)
C350B				
10-14 Ton				
Guide Roll	8000	(3629)	148	(264)
Drive Roll	12000	(5443)	222	(396)
Total	20000	(9072)		

ITEM	DESIGN DATA			
	WITHOUT BALLAST			
	Weight		Compression	
	lb	(kg)	lb/lineal inch	(kg./lineal cm)
	WITH LIQUID BALLAST			
	Weight		Compression	
	lb	(kg)	lb/lineal inch	(kg./lineal cm)
C350B				
10-14 Ton				
Guide Roll	11200	(5080)	208	(371)
Drive Roll	16800	(7620)	310	(554)
Total	28000	(12700)		

TABLE 2-6. DETROIT DIESEL ENGINE SPECIFICATIONS.

ITEM	DESIGN DATA	
	ENGLISH	METRIC
TYPE	In-Line, 3 Cylinder	
CYCLE	2 Stroke	
BORE	3.875 In.	9.8 cm

ITEM	DESIGN DATA	
	ENGLISH	METRIC
STROKE	4.5 In.	11.4 cm
DISPLACEMENT	159.3 Cubic Inches	2610 cc
TORQUE	202 ft.-lbs. at 1500 RPM	27.9 kg-m at 1500 RPM
HORSEPOWER	80 at 2200 RPM	
INJECTORS	N-45	
COMPRESSION RATIO	17 to 1	
IDLE SPEED	550 RPM	
HIGH IDLE SPEED (No Load)	3040 RPM	
FIRING ORDER	1-3-2	
EXHAUST VALVE CLEARANCE	0.025 In. (Cold) 0.023 In. (Hot)	0.635 mm 0.584 mm
OIL PRESSURE (2200 RPM)	30 PSI	2.1 kg/cm ²
THERMOSTAT SETTING	165-185°F	74-85°C
NOTE: For additional engine specifications refer to engine manufacturer's service literature		

TABLE 2-7. WATER SPRAY SYSTEM SPECIFICATIONS.

ITEM	DESIGN DATA	
	ENGLISH	METRIC
TANK CAPACITY	200 Gallons	757 Liters
PUMP TYPE	Centrifugal	
OPERATING PRESSURE	7-10 PSI at 800 RPM (Non-adjustable)	0.5-0.7 kg/cm ² at 800 RPM (Non-adjustable)
NOZZLE FLOW (TOTAL)	Approx. 0.25 GPM	0.95 LPM
NOZZLE ORIFICE		

TABLE 2-8B. SUNDSTRAND HYDROSTATIC TRANSMISSION SPECIFICATIONS.

ITEM	DESIGN DATA	
	ENGLISH	METRIC
HYDRAULIC TANK CAPACITY	9 Gallons (also supplies steering)	34 ltrs.
OIL TYPE	SAE 10W Viscosity Index 90 Approved Oils: Mobilfluid 423 Shell Tellus 29 Type "F" Transmission Fluid conforming to Ford Motor Co. specification No. ESW-M2C33F (or E)	
OIL FILTERS Suction Return Oil Cooler By-pass Valve	10 Micron 33 Micron Opens at 15 PSI	Opens at 1 kg/cm ²

ITEM

ENGLISH

METRIC

SYSTEM PRESSURES

(At 100–150° Oil Temp and
1500–2000 RPM engine
speed)

Charge Pump Pressure
(Transmission in Neutral)

190–220 PSI* (Controlled by
Relief Package in Charge Pump)

13.4–15.5 kg/cm²* (Controlled
by Relief Package in Charge
Pump)

Transmission in Forward
or Reverse

150–180 PSI* (Controlled by
Relief Package in Hydraulic
Motor)

10.5–12.7 kg/cm²* (Controlled
by Relief Package in Hy-
draulic Motor)

Main Pump Pressure

5500 (± 200) PSI

386.7 (± 14) kg/cm²

Control Pressure (Trans-
mission in Forward or
Reverse)

45 PSI approximately

3.2 kg/cm² approximately

Case Pressure

40 PSI Max. (Normally 10 PSI)

2.8 kg/cm² (Normally 0.7 kg/cm²)

Suction Oil

10 In. HG Maximum

25.4 HG Maximum

HYDRAULIC PUMP

Type

Variable Displacement Axial Piston

Swashplate Angle

18° Max. Either Side of Center

Maximum Displacement

4.2 Cubic Inches per Revolution
at 18° Swashplate Angle

68.8 cc per Revolution at 18°
Swashplate Angle

Maximum Pressure Rating

5500 PSI

386.7 kg/cm²

Maximum Case Pressure

40 PSI

2.8 kg/cm²

Minimum Main Port

130 PSI Above Case Pressure

9.1 kg/cm² Above Case Pressure

Pressure

Maximum Allowable Case

180° F

Temperature

Maximum Shaft Speed

3000 RPM

At No Load

At 4700 PSI (330.5

2810 RPM

kg/cm²)

Charge Check Flow Rating

10 GPM

37.9 LPM

Charge Pump Displacement

0.75 Cubic Inch Per Revolution
9 GPM Max. at High Idle

12.3 cc Per Per Revolution
34.1 LPM Max. at High Idle

Port Sizes

Main Line Inlet/Outlet

3/8–16 Thread, Four Bolt,
Split-flange Boss

9.525 mm–16 Thread, Four Bolt,
Split-flange Boss

Case Ports (Inlet and
Outlet)

7/8–14 UNF–2B, O-ring Boss

22.225 mm–14 UNF–2B, O-ring
Boss

Charge Pump Inlet

7/8–14 UNF–2B, O-ring Boss

22.225 mm–14 UNF–2B, O-ring
Boss

Control Lever Movement

26° Either Direction from Center

* Above case pressure

ITEM	DESIGN DATA	
	ENGLISH	METRIC
HYDRAULIC MOTOR		
Type	Fixed Displacement, Axial Piston	
Displacement	4.26 Cubic Inches at 18° Pump Swashplate Angle	69.8 cc at 18° Pump Swashplate Angle
Charge Pressure Relief Valve setting	150-180 PSI	10.5-12.7 kg/cm ²
Main Relief Valve Setting	5500 PSI Above Charge Pressure	386.7 kg/cm ² Above Charge Pressure
Port Sizes		
Main Line Inlet/Outlet Ports (2)	3/8-16 Thread Four Bolt, Split-flange Boss	9.525 mm-16 Thread, Four Bolt Split-flange Boss
Case Drain Port	7/8-14 UNF-2B, O-ring Boss	22.225 mm-14 UNF-2B, O-ring Boss

TABLE 2-9. FINAL DRIVE AND DRUM ASSEMBLY SPECIFICATIONS.

ITEM	DESIGN DATA	
	C350B	
FINAL DRIVE GEAR RATIO	60.1: 1	
LUBRICATION		
Type	SAE 90 Multi-purpose Gear Oil	
Quantity	4 Quarts (3.8 ltrs.)	
GEAR TOOTH DATA		
Inner Sun Gear	17 Teeth	
Inner Planet Gears	47 Teeth	
Ring Gear	108 Teeth	
Outer Sun Gear (Cage)	29 Teeth	
Outer Planet Gears	47 Teeth	
GEAR BEARING BORE		
Inner Planet Gears	1.9800-1.9810 In. 50.317 - (50.292 mm)	
Outer Planet Gears	2.5312-2.5322 In. (64.292-64.318 mm)	
PLANETARY SHAFT O.D.		
Inner Planet Gears	0.9998-0.9993 In. (25.395-25.382 mm)	
Outer Planet Gears	1.1868-1.1873 In. (30.145-30.157 mm)	

ITEM	C350B	
PLANETARY SYSTEM TORQUE		
Inner Planet Capscrews	15 ft.-lbs. (2.073 kg-m)	
Outer Planet Capscrews	15 ft.-lbs. (2.073 kg-m)	
Drum Hub Capscrews	120 ft.-lbs. (16.584 kg-m)	
Planet Anchor Flange Capscrews	200 ± 10 ft.-lbs. (27.64 ± 1.38 kg-m)	
Anchor Flange to Outer Planetary Hub 12 Point Capscrews	120 ft.-lbs. (16.584 kg-m)	
MOTOR HOUSING TORQUE		
Housing to Frame Capscrews	88 ft.-lbs. (12.162 kg-m)	
Motor Mounting Capscrews	115 ft.-lbs. (15.893 kg-m)	
Bearing Carrier to Drum Capscrews	130 ft.-lbs. (17.966 kg-m)	
Bearing Carrier to Lock-plate Capscrews	105 ft.-lbs. (14.511 kg-m)	
Bearing Carrier Shimring	0.002 in. (0.0508 mm) Preload to 0.003 in. (0.0762 mm) End Play	

TABLE 2-10. STEERING SYSTEM SPECIFICATIONS.

ITEM	DESIGN DATA	
	ENGLISH	METRIC
SYSTEM TYPE	Hydrostatic	
HYDRAULIC TANK CAPACITY	9 Gallons (also supplies transmission)	34 ltrs.
OIL TYPE	SAE 10W Viscosity Index 90 Approved Oils: Mobilfluid 423 Shell Tellus 29 Type "F" Transmission Fluid conforming to Ford Motor Co. specification No. ESW-M2C33F (or E)	
RELIEF PRESSURE		
Detroit Diesel	1500 ± 50 PSI	105.5 ± 3.5 kg/cm ²

ITEM	DESIGN DATA	
	ENGLISH	METRIC
RELIEF VALVE SETTING	1500 PSI	105.5 kg/cm ²
HYDRAULIC PUMP (Detroit Diesel Only) Type Pump Output at 2400 Engine RPM and no Pressure Restriction	External Gear 18.6 GPM NOTE: Flow divider controls to 6.5 ± 1.0 GPM.	70.4 LPM NOTE: Flow divider controls to 24.6 ± 4 LPM.
ROTATION VIEWED FROM SHAFT END	Counterclockwise	
PUMP DIMENSIONS		
Gear Diameter	2.1965–2.1970 In.	55.791–55.804 mm
Gear Width	1.1545–1.550 In.	29.324–39.370 mm
Gear Lash	0.006–0.010 In.	0.152–0.254 mm
Gear to Body	0.00175 In.	0.043 mm
Body Bore	2.199–2.200 In.	55.855–55.880 mm
Bearing Diameter	2.1970–2.1975 In.	55.804–55.817 mm
Bearing Bore	0.995–1.000 In.	25.273–25.400 mm
Bearing Width	1.9990–1.9993 In.	50.775–50.782 mm
Bearing to Shaft	Total 0.0025 In.	Total 0.0635 mm
Between Flats	0.0002–0.0005 In.	0.0051–0.0127 mm
FLOW DIVIDER (Detroit Diesel Only) Input Rating Controlled Flow Relief Setting	30 GPM 6.5 ± 1.0 GPM 1500 ± 50 PSI	114 LPM 25 ± 4 LPM 105.5 ± 3.5 kg/cm ²
STEERING CYLINDER	Double Action	

ITEM	DESIGN DATA	
	ENGLISH	METRIC
STEERING WHEEL TURNS (Stop to Stop)	2 1/4 Clockwise (3 Seconds Clockwise and 3.5 Seconds Counterclockwise)	
STEERING HANDPUMP Type Displacement Port Size	Open Center, Rotary Actuated 7.4 Cubic Inches per Revolution 3/4-16 UNF (All Ports)	121.3 cc per Revolution 19.05 mm-16 UNF (All Ports)
GUIDE ROLL STEERING ANGLE (Full Turn)	45° Each Side	
CLEARANCE BETWEEN GUIDE ROLL DRUMS	0.010-0.030 In.	0.25-0.76 mm
TRUNNION TORQUE Steering Axle Nuts Oscillation Pin Nut King Pin Nut Trunnion Capscrews	200, then 45 ft.-lbs. 200, then 75 ft.-lbs. 200, then 75 ft.-lbs. 200 ft.-lbs.	27.6, then 6.2 kg-m 27.6, then 10.4 kg-m 27.6, then 10.4 kg-m 27.6 kg-m

TABLE 2-11. BRAKE SYSTEM SPECIFICATIONS.

ITEM	DESIGN DATA	
	ENGLISH	METRIC
BRAKE DRUM DIAMETER	10.0 In.	25.4 cm
BRAKE LINING THICKNESS	0.25 In.	0.64 mm
LINING TYPE	Segmented, Riveted	
BRAKE LEVER ADJUSTMENT	80 Lbs. Min. Pull	36.3 kg-Min. Pull
BACKING PLATE CAPSCREWS	49 ft.-lbs.	6.8 kg-m
BRAKE HUB TO BRAKE DRUM CAPSCREWS	49 ft.-lbs.	6.8 kg-m
BRAKE SHAFT NUT	100 ft.-lbs.	13.8 kg-m

FOOT-POUNDS (U.S.)

KILOGRAM-METERS (EUROPEAN)

SIZE	TORQUE		SIZE	TORQUE		SIZE	TORQUE		SIZE	TORQUE	
	UNC	UNF		UNC	UNF		UNC	UNF		UNC	UNF
1/4	6	7	3/4	200	220	1/4	0.83	0.97	3/4	27.66	30.43
5/16	13	14	7/8	300	320	5/16	1.80	1.94	7/8	41.49	44.26
3/8	23	25	1	440	480	3/8	3.18	3.46	1	60.85	66.38
7/16	35	40	1 1/8	600	660	7/16	4.84	5.53	1 1/8	82.98	91.28
1/2	55	65	1 1/4	840	920	1/2	7.16	8.99	1 1/4	116.17	127.24
9/16	80	90	1 3/8	1100	1260	9/16	11.06	12.45	1 3/8	152.13	174.26
5/8	110	130	1 1/2	1460	1460	5/8	15.21	17.98	1 1/2	201.92	226.81

SAE GRADE 8 CARBON STEEL CAPSCREWS AND PLACEBOLTS

1/4	9	10	3/4	280	320	1/4	1.24	1.38	3/4	38.13	44.26
5/16	18	20	7/8	460	500	5/16	2.49	2.77	7/8	63.62	69.15
3/8	35	35	1	680	740	3/8	4.84	4.84	1	94.04	102.34
7/16	55	60	1 1/8	960	1080	7/16	7.61	8.29	1 1/8	132.77	149.36
1/2	80	90	1 1/4	1360	1500	1/2	11.06	12.45	1 1/4	188.08	207.45
9/16	110	130	1 3/8	1780	2040	9/16	15.21	17.98	1 3/8	246.17	282.13
5/8	170	180	1 1/2	2360	2660	5/8	23.51	24.89	1 1/2	326.39	356.81

NOTE This table lists torque values for standard hardware and is intended as a guide for average applications involving typical stresses and machined surfaces. Values are based on the physical limitations of clean, plated and lubricated hardware. In all cases, when an individual torque value is specified, it should take priority over values given in this table. Replace original equipment with hardware of equal grade.

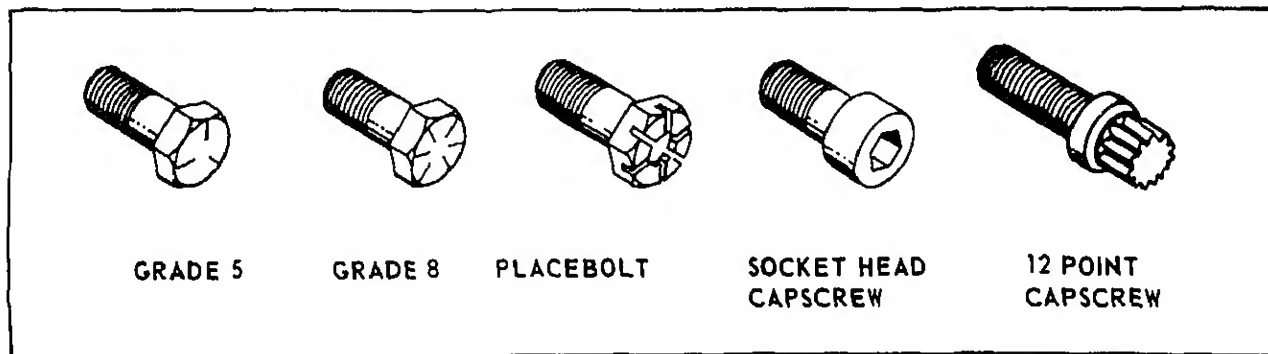
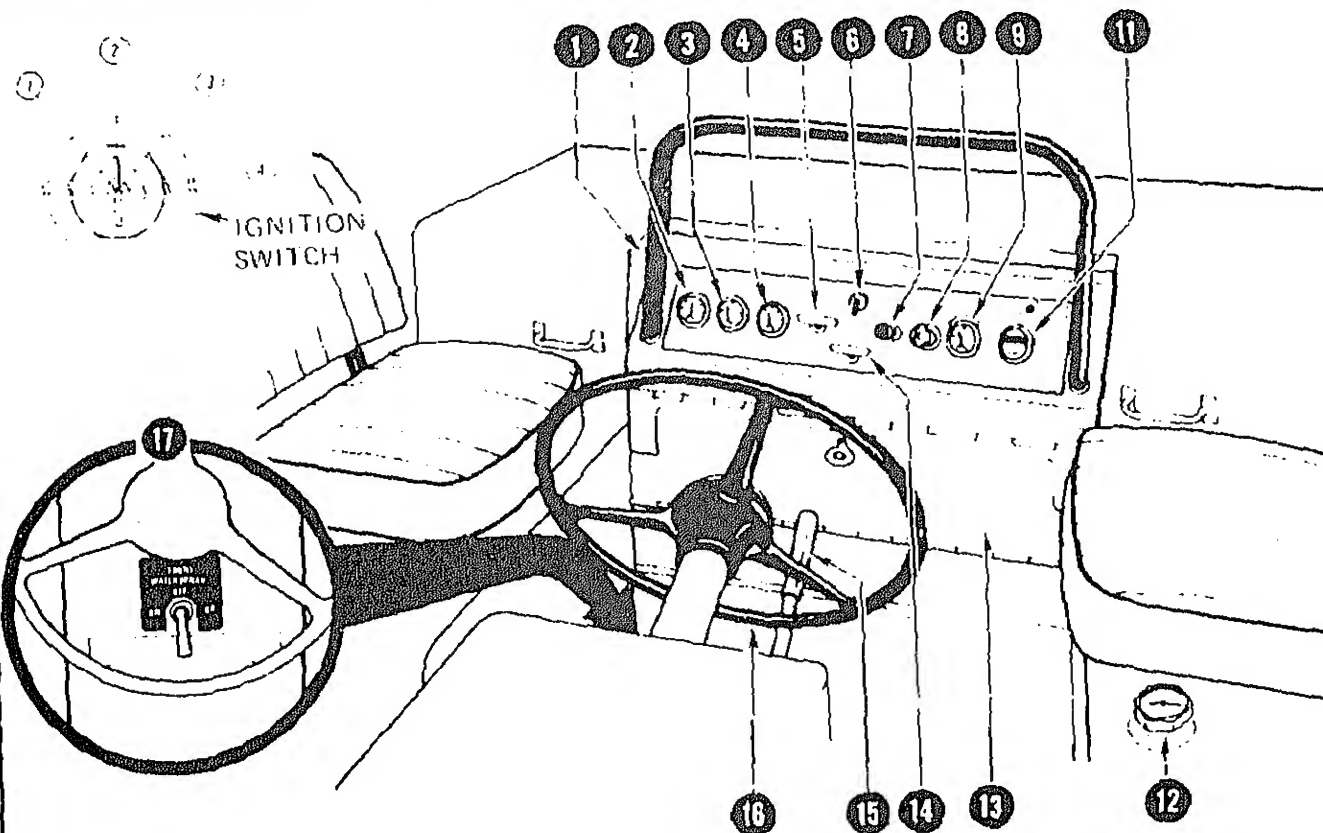


FIGURE 2-2. TYPES OF HARDWARE.

This section contains instructions necessary for operation of the C350B Wheel Roller. These instructions must be carefully reviewed and understood before attempting to operate the unit. Also, new operators must be thoroughly trained by a skilled operator before attempting to operate the unit unassisted.

compact, efficient, and reliable mechanical condition to ensure prolonged efficiency. Report any mechanical failure immediately for correction. Even minor failure or damage may eventually result in major failures if uncorrected.

NOTE: Follow all operating instructions in the order given on the operating instructions decal (see figure 3-3).



1. DIRECTION-THROTTLE BAIL

2. AMMETER

3. WATER TEMPERATURE

4. ENGINE OIL PRESSURE

5.

DIESEL ENGINE HAND THROTTLE

6. WATER SPRAY SWITCH

7.

DIESEL ENGINE STOP

8. IGNITION SWITCH

9. TRANSMISSION OIL TEMPERATURE

11. HOUR METER

12. FUEL GAUGE

13. VANDALISM SHIELD

14. EMERGENCY STOP (DETROIT DIESEL ONLY)

15. PARKING BRAKE

16. STEERING WHEEL

17. FRONT SPRAY SHUT OFF

			FUNCTION
1	DIRECTION- THROTTLE BAIL	Cross-bar with mechanical linkage to fuel system and transmission control.	Controls direction and speed of compressor. Vertical position detents and transmission in Neutral. Moving lever toward Guide Roll from Neutral causes unit to move forward. Moving lever toward Drive Roll from Neutral causes unit to move in reverse direction. Distance lever is moved from Neutral determines engine and unit speed. This lever also acts as a means for dynamic braking of the unit.
2	AMMETER	Gauge.	Indicates output current of alternator. Gauge may show slight discharge (RED) at idle, but should indicate charge (GREEN) when engine speed is increased.
3	ENGINE WATER TEMPERATURE	Gauge.	Indicates temperature of water circulating through engine. Needle should point to the white or cold operating band when engine is first started. After warmup period, needle should register in the green operating band. If needle registers in the red band, stop operation and correct the cause of the overheating condition.
4	ENGINE OIL PRESSURE	Gauge.	Indicates pressure of the oil being pumped through engine. Gauge may indicate high pressure when engine is first started but should drop to normal level as engine warms. Stop engine immediately if no pressure is indicated while engine is running.
5	DIESEL ENGINE HAND THROTTLE	Push-Pull Lever.	HAND THROTTLE - Controls engine speed independently of Direction-Throttle Bail. Use for cold starting conditions and to regulate initial warmup speed.
6	WATER SPRAY SWITCH	Toggle Switch.	Engages or disengages water spray system.

FIGURE 3-1 INDEX NO.	NOMENCLATURE	TYPE	FUNCTION
7	DIESEL ENGINE STOP	Push-Pull Lever.	ENGINE STOP – Shuts off diesel fuel flow for engine shutdown.
8	IGNITION SWITCH	Four-position, Key-operated Interlock Switch.	<p>No. 1 Position: Accessory Position. Applies power to water spray switch.</p> <p>No. 2 Position: OFF position. Removes all power to electrical circuit.</p> <p>No. 3 Position: ON position. Applies power to all electrical circuits. This position is also a lockout position. Prevents accidental engagement of the starter motor when engine is running. Ignition Key must be rotated back to this position to the No. 2 (OFF) position before starter motor can be energized again.</p> <p>No. 4 Position: Start position. Applies power to starter motor to crank engine. Switch spring-returns to No. 3 position when key is released.</p>
9	TRANSMISSION OIL TEMPERATURE	Gauge.	Indicates temperature of oil flowing through hydrostatic transmission and steering systems. Shut down unit if gauge pointer moves to RED zone.
10			
			CAUTION: Do not use starting fluid and cold start air together. It may damage engine components.
11	HOUR METER	Gauge.	Indicates total hours of engine operation.
12	FUEL	Gauge.	Indicates quantity of fuel remaining in fuel tank.

FIGURE 3-1 INDEX NO.	NOMENCLATURE	TYPE	FUNCTION
13	VANDALISM SHIELD	Hinged Panel.	Protects controls, engine compartment, and battery against vandalism.
14	EMERGENCY STOP (Detroit Diesel only)	Push-Pull Lever.	Shuts down engine if engine RPM cannot be controlled by Direction-Throttle Bail. This control shuts off air to engine. Lever must be manually re-set at the engine. (Refer to paragraph 3-28.) CAUTION: The EMERGENCY STOP should be used ONLY in the event of serious engine malfunctions.
15	PARKING BRAKE CONTROL LEVER	Overcenter Lever.	In BRAKE ON position (up), lever holds park brake shoes in "applied" position. In BRAKE OFF position (down), lever releases linkage that holds park brake shoes in "applied" position.
16	STEERING WHEEL	Power.	Controls oil flow to and from steering cylinder (Hydrostatic steering).
17	FRONT SPRAY SHUT-OFF CONTROL	Gate Valve.	Shuts off water supply to guide roll when water spray is required only on drive roll.

3-4. OPERATING CONTROLS AND INDICATORS.

3-5. The controls and indicators necessary for operation of the compactor are listed and described in Table 3-1 and illustrated in figure 3-1.

3-6. SAFETY PRECAUTIONS.

3-7. Always observe the following safety precautions to prevent possible injury to personnel and damage to the equipment.

a. TRAINED OPERATORS ONLY.

b. Always use slower unit speeds and added caution when operating close to a lift edge or when travelling downhill.

c. Never travel across a slope. Always travel up or down a grade.

d. Always set the park brake before dismounting the unit.

e. Never shut down the engine when travelling downhill. Always move the Direction-Throttle Ball toward the "neutral" position to slow the unit.

f. Report damage and faulty operation immediately. Do not operate the unit until corrected.

g. Make sure the operating decal is attached to the unit as shown in figure 3-3. Make sure that the markings on the decal are legible.

a. Set the park brake by moving the control lever to BRAKE ON position (UP).

b. Place the Direction-Throttle Bail in Neutral detented position (vertical).

c. Pull Hand Throttle out slightly (at approximately a 700 RPM setting).

NOTE: During cold weather conditions it may be necessary to proceed as follows:

Detroit Diesel Engine; Consult manufacturers service literature.

d. Turn the Ignition Key fully clockwise to engage the starter.

CAUTION: Do not crank the engine for more than **THIRTY SECONDS** at any one time. If the engine fails to start, set the **IGNITION** key to off and wait one (1) minute - allowing the starter to cool.

OPERATING INSTRUCTIONS C350B STEEL WHEEL ROLLER

Starting

- 1 Set park brake
- 2 Move throttle bail to Neutral (vertical position)
- 3 Start engine

4 To Protect Engine and Transmission

Do not operate above half throttle until transmission temperature is over 100° F

Operating

- 1 Release park brake
- 2 Direction and speed are controlled by bail. Machine will travel direction bail is moved. Additional bail movement increases speed.
- 3 To prevent stalling engine on an upgrade move bail back towards Neutral.

Stopping

- 1 Set park brake
- 2 Shut engine off

Do Not Lean - To prevent the machine from tipping over, do not lean over the side of the machine. Do not operate the machine on a slope greater than 15 degrees. If necessary, the machine should be backed up to the side of the slope to prevent the hydraulic tank from tipping over.

FOR SAFETY

TRAINED OPERATOR ONLY

- 1 Use proper control and avoid caution when operating close to all edges and when traveling downhill.
- 2 Travel up and down the grade when operating on slopes.
- 3 Remove hands and feet from moving machinery - do not operate machinery until stopped.
- 4 Always use proper wheel loader pattern and direction. Transmission and rear wheel should be in gear.
- 5 Follow the operating instructions, always read the operator's manual and operator's manual. (Litho) copies available from your HYSTER dealer.

NOTE: If the engine stalls after the third attempt, check the EMERGENCY STOP Control has been manually reset as described in paragraph 3-28.

3-9. OPERATING THE UNIT (see figure 3-1).

NOTE: Before operating the unit, allow the engine to idle at 700 RPM for approximately two minutes to allow engine and hydraulic oil to begin to reach operating temperature.

3-10 Release the park brake by pushing the control lever to the BRAKE OFF position (down).

3-11. SPEED AND DIRECTION CONTROL.

3-12. Speed and direction of the unit are controlled by the Direction-Throttle Ball (figure 3-1). Move the Direction-Throttle Ball off of "neutral" in the desired direction (forward or reverse). To increase unit speed, move the lever further away from the "neutral" position. To decrease unit speed, move the lever back toward the "neutral" position.

NOTE: Optimum torque to the drive drum is achieved by moving the Direction-Throttle Ball toward the "neutral" position when the engine starts to lug down. Move ball until engine RPM increases to loaded RPM speed.

3-13. DYNAMIC BRAKING.

3-14. Slowing or stopping the unit during operation is accomplished by moving the Direction-Throttle Ball toward "Neutral".

WARNING: Never shut down the engine when attempting to stop the unit. This will reduce or eliminate all dynamic braking capabilities.

3-15. DRUM SCRAPERS (see figure 3-4).

3-16. Both Guide Rolls and the Drive roll are equipped with full width, adjustable scrapers mounted ahead and behind each of the drums. These scraper bars are designed to keep the large pieces of material from clinging to the rolls when moving in either forward or reverse. Scrapers are spring loaded to provide positive drum contact.

scrapers into the "off-the-drum" position:

1. Pull scraper away from the drum.
2. Move the pawl into the lock position.
3. Slowly move the scraper towards the drum until the pawl holds the scraper.

WARNING: Always use extreme caution when positioning scrapers as they are under considerable spring tension and may become sharp when worn.

3-18. COCO MATS (See figure 3-4).

3-19. A full width coco mat is located on each roll and is used in conjunction with the water spray system to keep the rolls clean.

3-20. Both coco mat arrangements have "off-the-drum" locking positions. To lock either of the two coco mats "off-the-drum":

1. Pull or lift the coco mat off of the drum.
2. Engage the mat hook in the mat link.
3. Slowly move the coco mat towards the drum until the mat hook holds the mat.

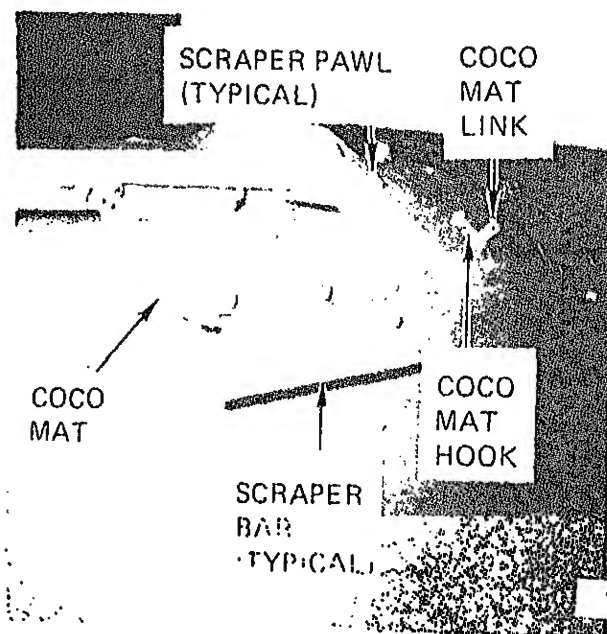


FIGURE 3-4.

3-21. WATER SPRAY SYSTEM (see figure 3-1).

3-22. The water spray system is designed to

push the water spray switch to the ON position. This will produce pressurized water spray on the Guide Roll and Drive Roll drums. The pressurized supply to the Guide Roll drum can be turned off (if conditions dictate) by rotating the Front Spray Shut-off lever. The water spray switch should be in the OFF position when the water spray system is not needed.

CAUTION: Do Not operate water system without water. Damage to pump may result.

3-23. UNIT SHUTDOWN (see figure 3-1).

a. Set the Direction-Throttle ball to the "neutral" position.

b. Set the Park Brake Control Lever to the BRAKE ON position (UP).

c. Set the IGNITION key to the "off" (vertical) position.

d. On units equipped with a diesel engine, pull the ENGINE STOP out. Hold in this position until the engine stops.

NOTE: If the Detroit Diesel engine fails to stop, pull out the EMERGENCY STOP lever. Reset the control as specified in paragraph 3-28. Troubleshoot the system to determine the malfunction before operating the unit again.

e. Position the Vandalism Shield over the instrument panel. If the unit is to be left unattended, lock the shield.

3-24. EMERGENCY ENGINE STOP (Detroit Diesel Only) (see figure 3-1).

3-25. A manually operated EMERGENCY STOP Control is mounted on the instrument panel to shut down the Detroit Diesel engine in the event of a serious engine malfunction. If the engine continues to run after the ENGINE STOP has been pulled out, or if the engine overspeeds, the shut-down device will prevent damage to the engine by cutting off the air supply and thus stop the engine.

3-26. The shut-down device (figure 3-5) consists of an air shut-off valve mounted in the engine air inlet housing. The shut-off valve is retained in the open position by a latch. A

3-27. RESETTNG EMERGENCY ENGINE STOP (Detroit Diesel Only) (see figure 3-5).

3-28. The emergency engine stop must be manually reset before the engine can be restarted. To reset the emergency stop, push the cam-pin handle (located on the engine air inlet housing) downward. This will open the shut-off valve. Then push the EMERGENCY STOP Control lever against the instrument panel.

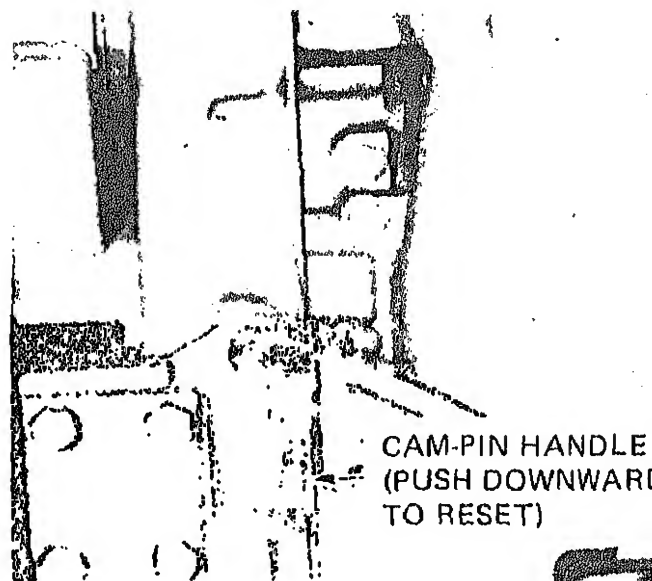


FIGURE 3-5.

3-29. MOVING THE UNIT (see figure 3-6).

3-30. Before moving a malfunctioning unit, the transmission by-pass valve **MUST** be opened. If the valve is not opened, the drive drum will have restricted movement.

Rotate the slotted cam 90 degrees clockwise. On units equipped with a Sundstrand Transmission, pull up and lock the control cable located under the hood on the hydraulic tank side of the unit.

CAUTION: The by-pass valve is not intended for towing a unit from one jobsite to another. Tow at speeds of one (1) to two (2) MPH (1.61-3.22 km/h) for as short a distance



FIGURE 3-6C. SUNDSTRAND TRANSMISSION BY-PASS VALVE ON DUMPS
UNITS.

3-31. SHIPPING THE UNIT.

3-32. When shipping the roller, the following eyes should be used. One eye is located at each end of the rear scraper bar mounted under each operator mounting step in the rear. The drive roll should be blocked front and rear and on both sides. The guide rolls must be blocked on both sides.

CAUTION: Do not block the guide rolls front and rear as it will shock load the trunnion king pin and bearing.

3-33. MISCELLANEOUS OPERATING POINTS.

- a. Using the hood as an arm rest will result in smooth control.
- b. No more than two people are allowed on the machine when operating.
- c. Do not use the steering wheel or throttle-throttle ball as machine mounting as it will result in smooth control.
- d. Always look in the direction of travel.

4-2. This section contains instructions necessary for proper Hyster-Care Maintenance for the C350B Steel Wheel Roller. Hyster-Care Maintenance is divided into two subsections: Hyster-Care Maintenance Schedule and Hyster-Care Maintenance Procedures. The maintenance schedule lists the recommended time intervals between maintenance checks. The procedures subsection provides detailed instructions for performing the maintenance checks. Instructions listed in the procedures subsection are given by systems and are not necessarily in the order listed in Table 4-1.

4-3. Hyster-Care Maintenance is a planned maintenance program that includes periodic inspection and lubrication. Hyster-Care main-

tenance checks are located on the instrument panel.

4-4 HYSTER-CARE MAINTENANCE SCHEDULE.

4-5 Table 4-1 lists the recommended maintenance checks. It is outlined in two schedules: the hourly schedule and the periodic schedule. If the unit is operated more than eight hours per day, the hourly schedule should be followed. If the unit is operated less than eight hours per day, the periodic schedule should be followed.

4-6. Maintenance checks given in Table 4-1 are listed in the same sequence as listed on the maintenance decal starting with the eight hour checks. The first and last columns of the table

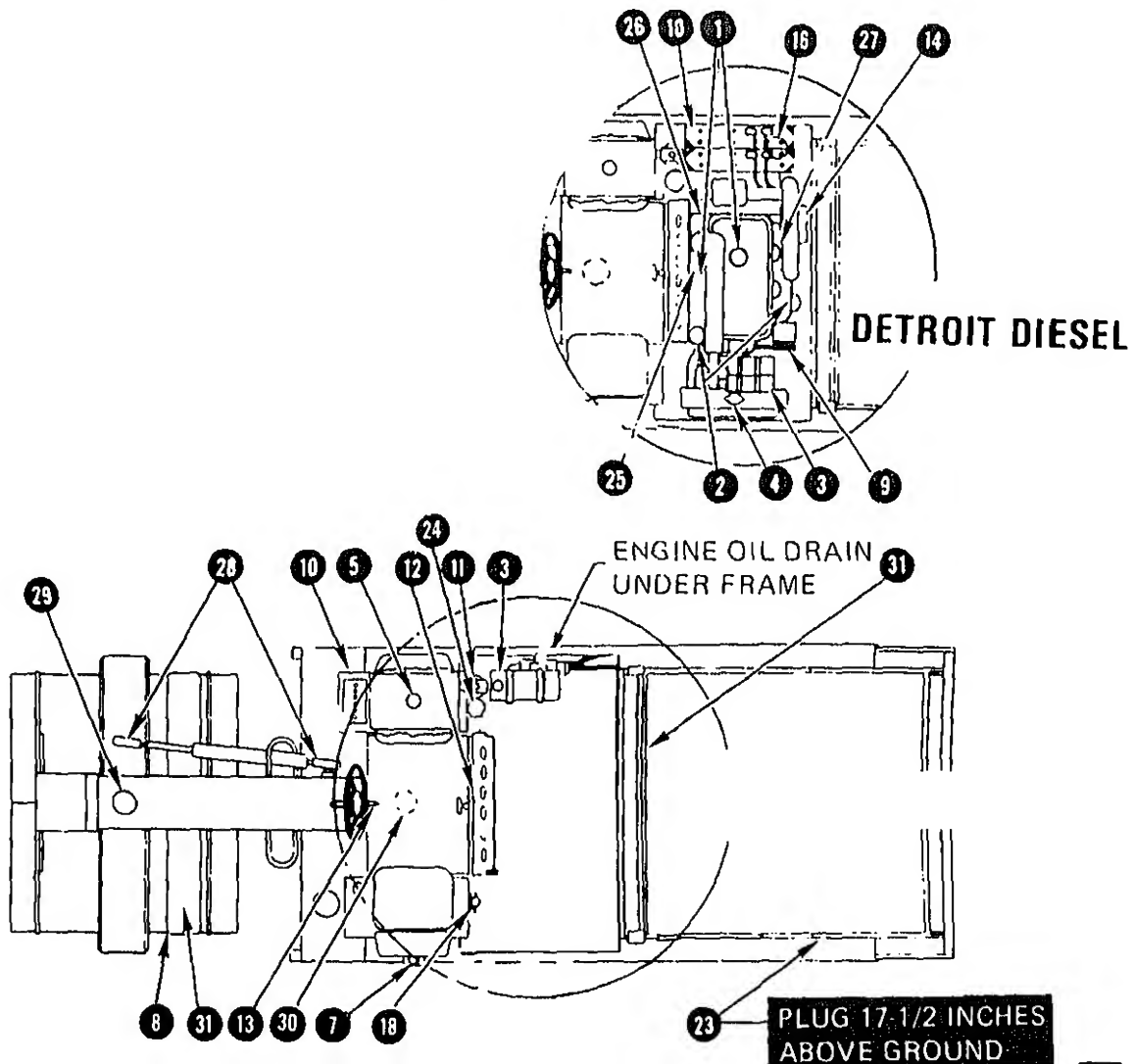


TABLE 4-1. HYSTER-CARE MAINTENANCE SCHEDULE.

FIGURE ITEM NO.	ITEM	SCHEDULE HOUR/PERIOD							QUANTITY	TYPE	TC
		8/ day	50/ wk	100/ 2wks	200/ mo	300/ 6wks	500/ 3mo	1000/ yr			
1	ENGINE OIL + DETROIT DIESEL 3-53	X		C						NOTE: Refer to engine manufacturer's maintenance manual for engine oil specifications. MIL - L - 2104C	4
2	FUEL STRAINER AND FILTER (D) +	X				C				SEE PARTS MANUAL	4
3	AIR CLEANER FILTER + DETROIT DIESEL	X						C C C		SEE PARTS MANUAL NOTE: Check air restriction indicator on Detroit Diesel	4
4	COOLING SYSTEM + DETROIT DIESEL	X						C C C	16 Qts. (15.1 ltr.)	Winter: Water and ethylene glycol base anti-freeze with rust inhibitors and anti-foaming qualities. Summer: Water and rust inhibitor. MIL - O - A - 548	4
5	HYDRAULIC OIL TANK	X						C	9 Gals. (34.1 ltr.)	Approved Oils: MIL - L - 2104B Mobilfluid 423 Shell Tellus 29 Type "F" transmission fluid conforming to Ford Motor Co. spec. #ESW-M2C33F or E	4

TABLE 4-1. HYSTER-CARE MAINTENANCE SCHEDULE (CONT.).

ITEM	ITEM	SCHEDULE HOUR/PERIOD							QUANTITY	TYPE	REFER TO PARA- GRAPH
		8/ day	50/ wk	100/ 2wks	200/ mo	300/ 6wks	500/ 3mo	1000/ yr			
	FUEL TANK	X							25 Gals. (94.6 ltr.)	fuel + No. 2 Diesel MIL - VV - F - 800	
	GUIDE ROLL AXLE BEARINGS	X							A. R.	Multi-purpose Grease MIL - G - 10924B	4-95
	DRIVE BELTS		X								4-36 4-72
	BATTERY			X					A. R.	Distilled Water	4-32
	TRANSMISSION SUCTION FILTER			X				C25		SEE PARTS MANUAL	4-69
	THROTTLE AND TRANS- MISSION LINKAGE			X					A. R.	Engine Oil MIL - L - 2104C	4-61
	PARKING BRAKE LEVER (Lube and Adjustment)			X					A. R.	Multi-purpose Grease MIL - G - 10924B	4-82
	THROTTLE CONTROL MECHANISM (D) +			X					A. R.	Multi-purpose Grease MIL - G - 10924B	+
	ENGINE OIL FILTER + DETROIT DIESEL			C						SEE PARTS MANUAL	4-59

TABLE 4-1. HYSTER-CARE MAINTENANCE SCHEDULE (CONT.).

FIGURE ITEM NO.	ITEM	SCHEDULE HOUR/PERIOD						QUANTITY	TYPE	REF TO PA GRA
		8/ day	50/ wk	100/ 2wks	200/ mo	300/ 6wks	500/ 3mo	1000/ yr		
23	FINAL DRIVE (Oil Bath)						X	C	SAE 90 Multi-purpose gear oil. MIL-L-2105B	4-87
24	TRANSMISSION RETURN FILTER							C25	SEE PARTS MANUAL	4-71
25	ENGINE BLOWER SCREEN (D) +							X		4-27
26	ENGINE CRANKCASE BREATHING (D) +							X		4-25
27	ENGINE AIR BOX DRAIN (D) +							X		4-29
28	STEERING CYLINDER BALL JOINTS							X	Multi-purpose Grease MIL-G-10924B	4-99
29	STEERING TRUNNION BEARINGS							X	Multi-purpose Grease MIL-G-10924B	4-97
30	WATER SPRAY FILTERS							A.R.		4-75
31	WATER SPRAY NOZZLES							A.R.		4-78

X = Check.

C = Change.

A.R. = As Required.

+ = Refer to engine manufacturer's maintenance instructions.

ould be used to locate the applicable maintenance procedure. Figure 4-1 shows the location of all maintenance points.

7. HYSTER-CARE MAINTENANCE PROCEDURES.

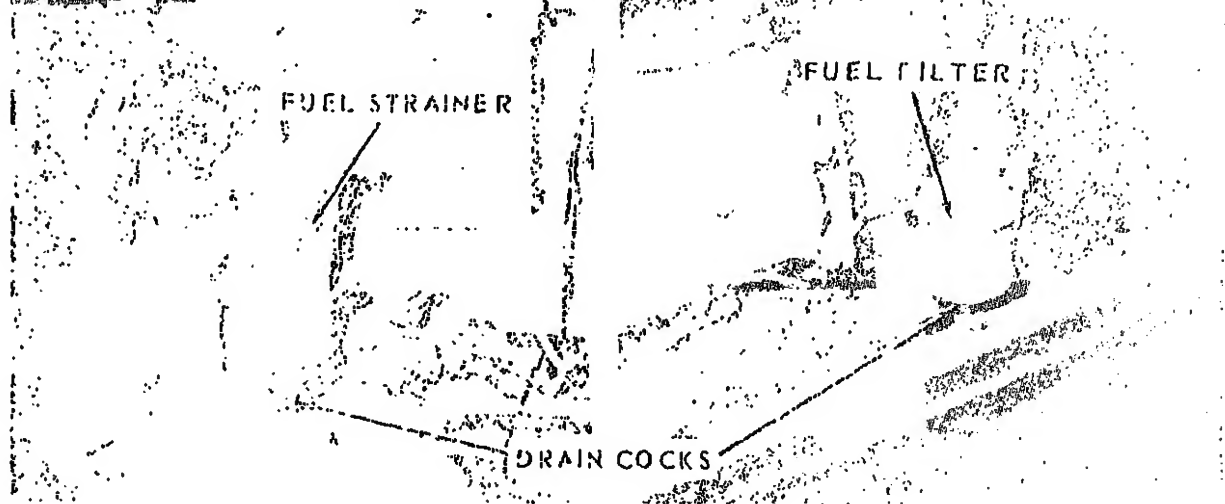


FIGURE 4-6. DETROIT DIESEL FUEL FILTER AND FUEL STRAINER.

4-17. DETROIT DIESEL FUEL STRAINER AND FILTER (see figure 4-6).

4-18. Drain approximately $\frac{1}{4}$ pint of fuel from each filter bowl daily to remove dirt and water accumulations. A drain cock is located in the bottom of each filter bowl for this purpose. The filter elements in the strainer and filter must be replaced at the time interval specified in Table 4-1. Replace the elements as follows:

- a. With the engine shut down, place a suitable container under the bowl of the strainer or filter and open the applicable drain cock. The fuel will drain more freely if the retaining nut at the inlet/outlet head is loosened slightly.

- b. Support the bowl, then unscrew the retaining nut and remove the bowl and element.

- c. Remove and discard the element and gasket. Clean the bowl with fuel oil and drain thoroughly with a clean, lint-free cloth and compressed air.

- d. Place a new filter element, that has been thoroughly soaked in clean fuel oil, over the stud and push the element down onto the seal. Close the drain cock and fill the bowl approximately two-thirds full of clean fuel oil.



FIGURE 4-7. AIR CLEANER MAINTENANCE.

e. Install a new gasket in the inlet/outlet head. Place the bowl with element into position under the inlet/outlet head and start the retaining nut into the bowl stud.

f. Tighten the retaining nut only enough to prevent fuel leakage. Remove the plug in the inlet/outlet head and fill the bowl with clean fuel oil.

4-19. AIR FILTRATION SYSTEM.

4-20. AIR CLEANER FILTERS(S) (see figure 4-7).

4-21.

The Detroit Diesel restriction Indicator should be checked every eight hours of operation, or daily.

4-22. The air cleaner element is a reusable

element that can be cleaned periodically. The element should be replaced, however, after ten cleanings or when the specified change interval occurs. Remove and clean the element as follows:

NOTE: Clean the exterior of the air cleaner body before disassembly.

a. Loosen the retainer bar securing the element. Then remove the retainer bar from the housing.

b. Remove the element from the housing.

c. Tap the element lightly against a smooth surface while keeping it parallel to the surface to avoid damage to the end cap.

d. Blow out the element in the opposite direction of normal air flow using compressed air. Do not exceed 30 PSI (2.1 kg/cm²) air

pressure against the element.

e. Carefully inspect the dry element for damaged paper pleats by placing a light inside of the element. Replace element if it is damaged or after ten cleanings.

f. Clean the intake housing with a lint-free cloth moistened with cleaning solvent before installing element.

g. On Detroit Diesel units, reset the restriction indicator by pushing the reset button at the end of the indicator body after reassembly.

h. Check rubber dust unloading valve for cracks, clogging or deterioration.

4-25. DIESEL CRANKCASE BREATHER (see figure 4-9).

4-26. Remove the crankcase breather from the engine each 1,000 hours of operation and wash the breather in clean fuel oil. Dry thoroughly with compressed air. Also clean the breather cap, mounted on the valve rocker arm cover, in clean fuel oil every time the engine oil is changed.

4-27. DETROIT DIESEL BLOWER SCREEN (see figure 4-10).

4-28. Inspect the blower screen each 1,000 hours of operation. If necessary, clean the screen in clean fuel oil and dry thoroughly with compressed air. Reinstall the screen and gasket assembly with the screen side of the assembly toward the blower.

4-29. ENGINE AIR BOX DRAIN (see figure 4-11).

4-30. With the engine running, check for flow of air from the air box drain tubes each 1,000 hours of operation. If the tubes are clogged, remove, clean and reinstall the tubes. The air box drain tubes should be cleaned periodically even though a clogged condition is not apparent.

4-31. ELECTRICAL SYSTEM.

4-32. CHECKING BATTERY ELECTROLYTE LEVEL.

4-33. The electrolyte level in each battery cell should never be below the top of the plates. If the level is low, add drinking water. The electrolyte is only in correct when filled to the

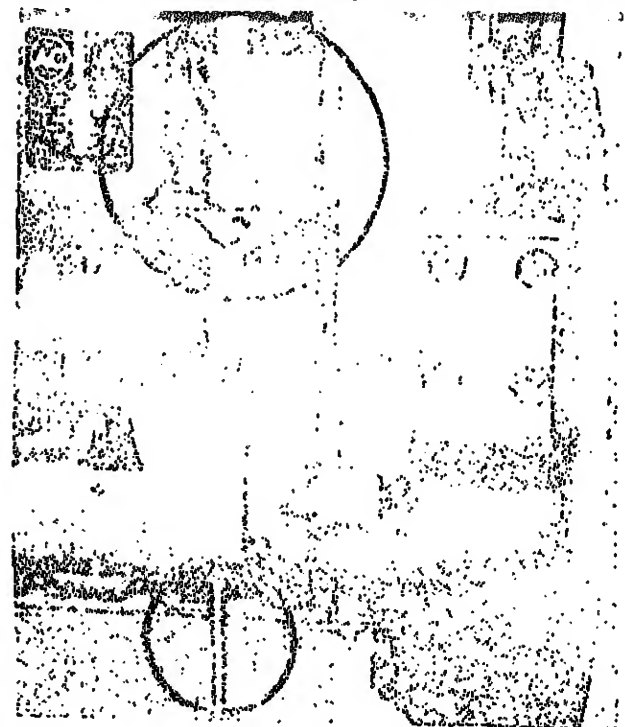
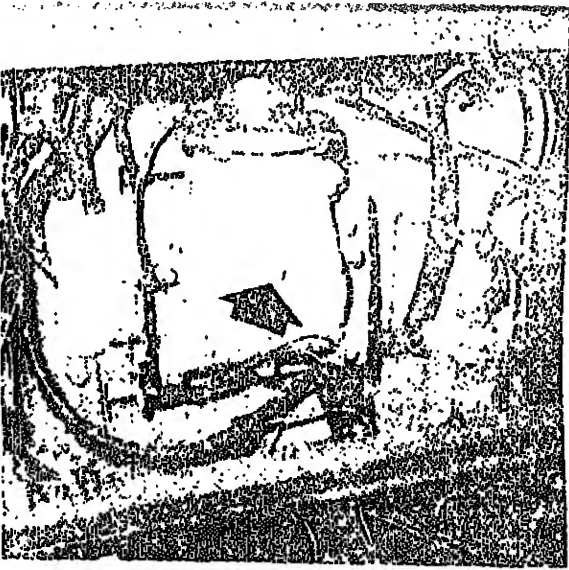


DETROIT DIESEL

FIGURE 4-9. DIESEL CRANKCASE BREATHER.

4-37. Examine the belt(s) for cracks on the inner surface of the plys before making tension adjustments. A belt that is adjusted too tight places an added load on the water pump and alternator bearings, as well as the belt. A belt that is too loose allows slippage, premature failure of the belt and may lower the output of

4-36. ALTERNATOR AND WATER PUMP DRIVE BELT(S).



be checked and adjusted after each 50 hours of operation or weekly. The alternator belt should deflect $\frac{1}{4}$ inch (6.35 mm) with pounds (2.7 kg) of force.

CAUTION: (Detroit Diesel Only) Replace both alternator drive belts when one of them both needs replacing.

4-38. ELECTRICAL WIRING (see figure 4-14).

4-39. Periodically inspect all wiring for: Proper routing, loose terminal connections, cracks, wear, faulty insulation, brittleness, and that they are free from oil and grease. Electrical components should be connected per the schematic drawing (figure 4-14) when components are replaced.

CAUTION: Do not use a wire smaller than the original factory installed wires.

4-40. COOLING SYSTEM (see figure 4-15).

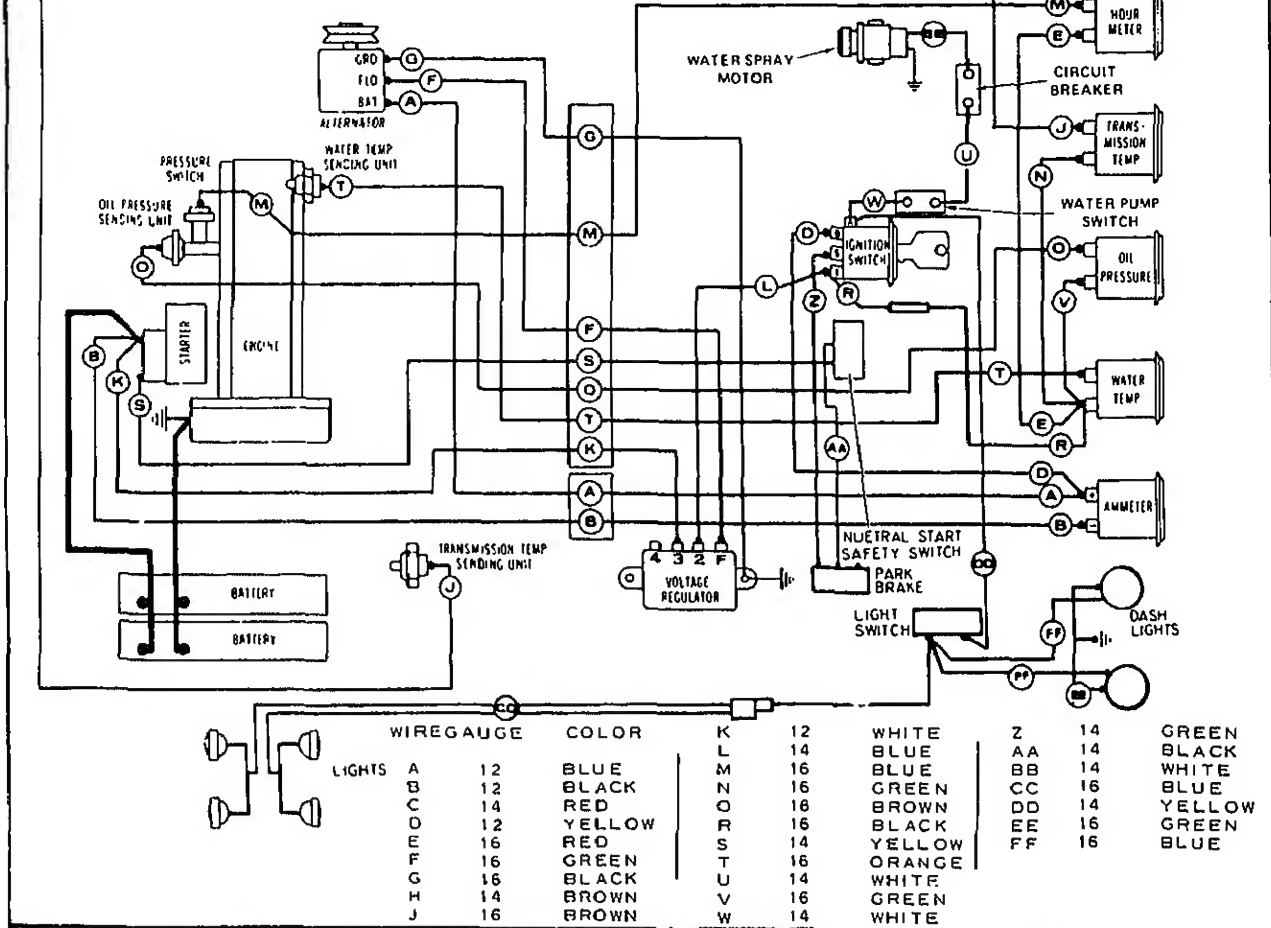
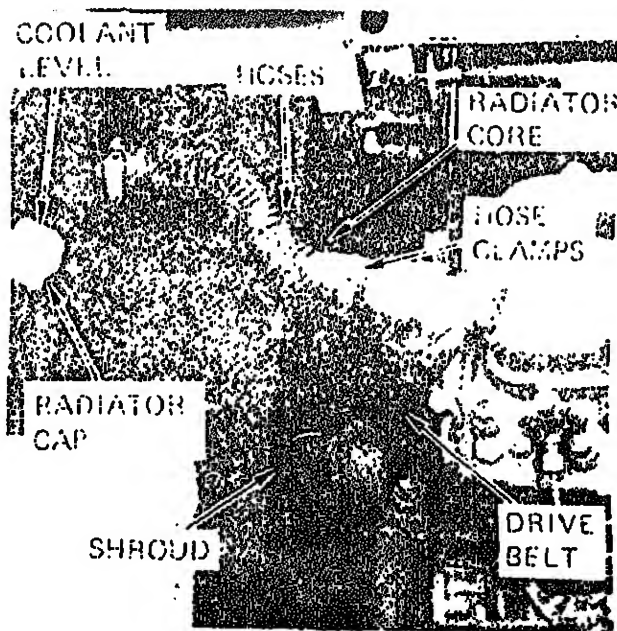


FIGURE 4-14. ELECTRICAL SYSTEM SCHEMATIC (WITH DIESEL ENGINE).



4-41. RADIATOR.

4-42. The radiator should be filled to one inch (2.54 cm) below the filler neck.

4-43. The radiator core must be serviced if it becomes clogged at any point where light cannot be seen through the core. Blow out thoroughly with compressed air, then steam clean if facilities are available. Apply the air or steam to the side opposite of normal air flow. Be careful not to bend the radiator fins. If fins are bent, straighten carefully.

4-44. The radiator cap gasket and filler neck seat must also be checked to be sure that they are providing the proper seal. If the rubber face of the valve is damaged, a new cap must be installed. Always install a cap having a 7 PSI (0.53 kg/cm²) pressure rating. Always inspect the overflow pipe for restrictions. A plugged or damaged pipe may prevent the cap from

4-46. The fan shroud directs air flow through the radiator with a minimum loss of air due to turbulence. On Detroit Diesel units, the four capscrews securing the shroud can be loosened so that the shroud can be moved up or down for proper positioning with respect to the fan blades. DO NOT ALTER, ADD TO, OR REMOVE THE SHROUD. Check to see that it is anchored securely and not bent from its original shape. The depth that the fan penetrates into the shroud is critical and should not be altered.

4-47. WATER PUMP.

4-48. The water pump should be checked for leaks after each 50 hours of operation. Water pump leaks may allow air to be drawn into the cooling system. This can cause foaming or

immediately if leakage occurs.

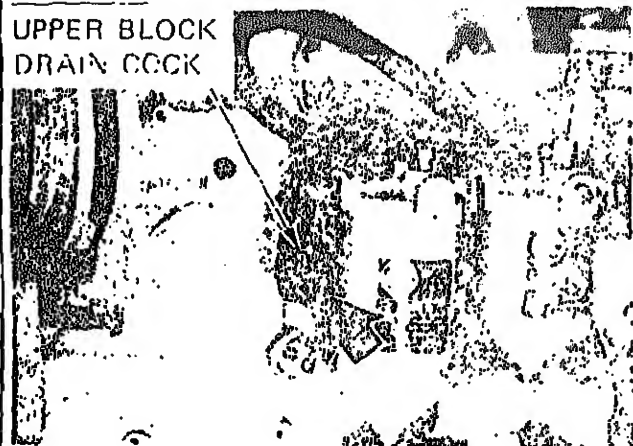
4-49. HOSES.

4-50. Examine hoses at least twice each year for cracks, hardening, softening and swelling. Remove the hose and check the interior section. Hoses can deteriorate on the inside and appear satisfactory on the outside. The hose must be pliable and able to pass coolant without restriction.

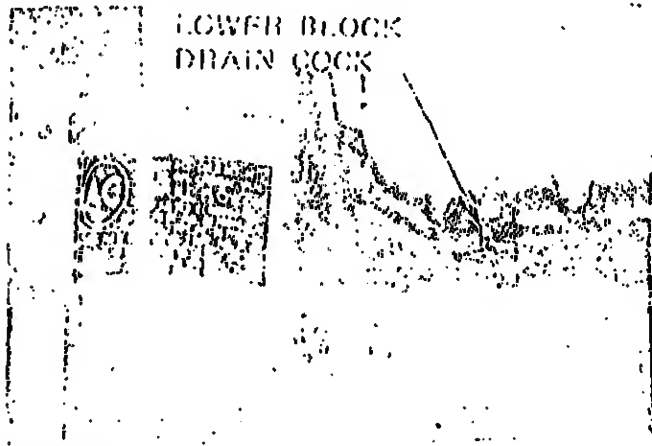
4-51. FLUSHING THE SYSTEM.

4-52. Rust in the radiator or coolant indicates that the corrosion inhibitor has lost its effectiveness. This can be avoided by draining and flushing the system at least once each year. For effective flushing, remove the radiator hoses and the thermostat. Open the engine

UPPER BLOCK
DRAIN COCK



LOWER BLOCK
DRAIN COCK



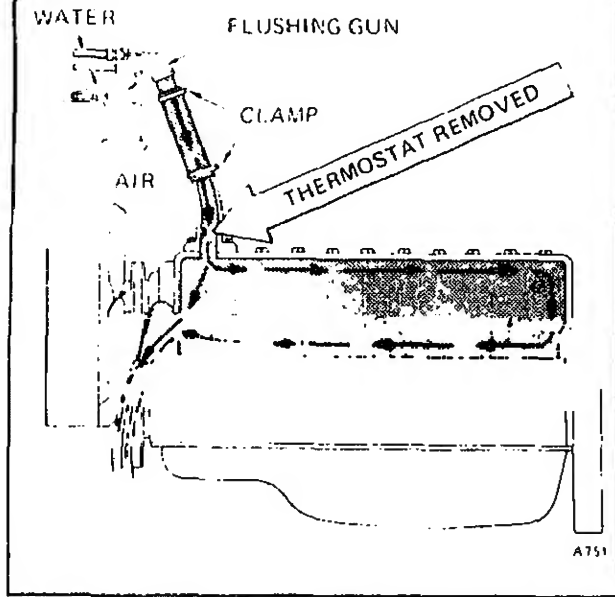


FIGURE 4-17. REVERSE FLUSHING ENGINE BLOCK.

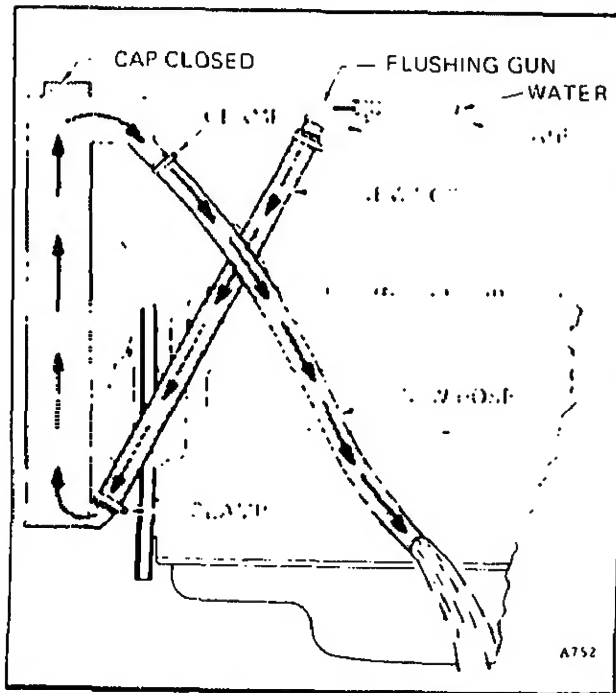


FIGURE 4-18. REVERSE FLUSHING RADIATOR.

drain cock (see figure 4-16) and allow the block to drain. Close the drain cock and reverse flush the block as shown in figure 4-17. Reverse flush the radiator as shown in figure 4-18.

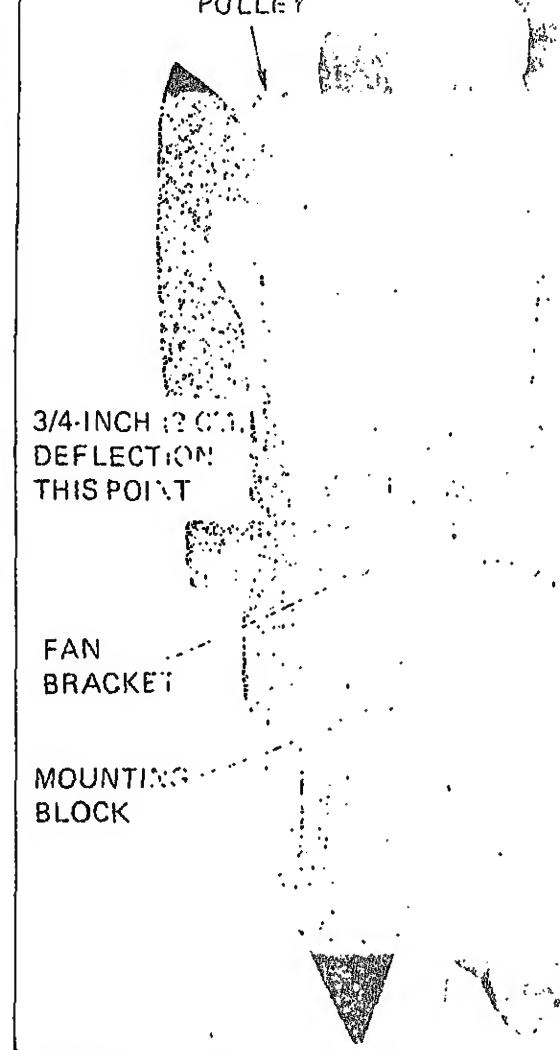
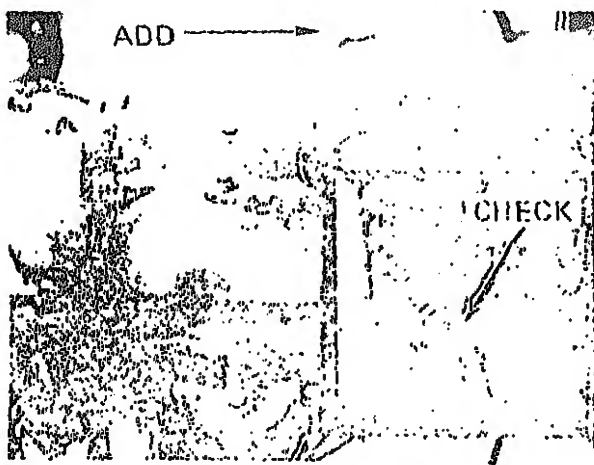


FIGURE 4-19. DETROIT DIESEL FAN BELT ADJUSTMENTS.

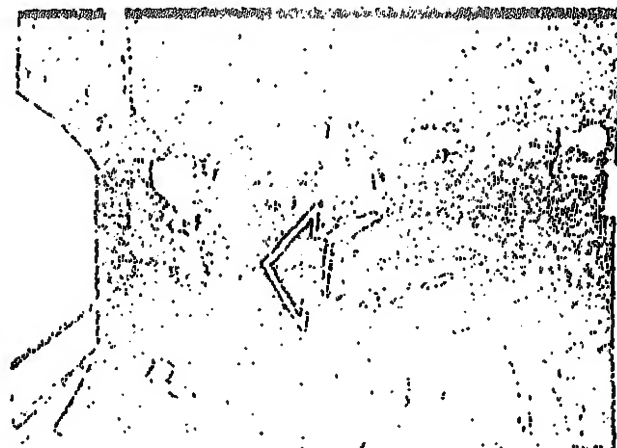
NOTE: Make sure that the thermostat is removed. Flushing as shown in figure 4-17 will close the thermostat and prevent complete flushing of the block. After flushing the system, add coolant as specified in Table 4-1.

4-53. DETROIT DIESEL FAN DRIVE BELTS (see figure 4-19).

4-54. Examining the belt for cracks.



CHECK AND ADD



FILTER

after each 50 hours of operation, or weekly.

4-55. New drive belts will stretch after the first few hours of operation. After the first eight hours of operation, check the belts again and retighten if necessary. Adjust the belt tension so that a firm push with the thumb at a point midway between the longest span deflects the belts approximately $\frac{3}{4}$ inch (2 cm). Adjust the belt tension as follows:

a. Loosen the four capscrews (2 on each side of engine) securing the fan bracket to its mounting blocks. Also loosen the four capscrews securing the fan shroud to the radiator.

b. If the belts are too tight, push the fan bracket downward to loosen the belts. If the belts are too loose, use a pry bar (between the stud welded on the inside of mounting bracket and the mounting block) to move the bracket upward.

CAUTION: When adjusting the fan pulley, always adjust the fan shroud the same distance in either direction. The fan must always be centered in the shroud.

c. When the correct adjustment is obtained, tighten the four fan bracket capscrews securely. Tighten the four fan shroud capscrews.

CAUTION: Before starting the engine, make sure that fan blade tips do not contact the shroud.

NOTE: Replace the two drive belts as a matched set when one is worn. Single belts of similar size should not be used as a substitute for a matched belt set. Premature belt wear can result because of belt length variations after short periods of operation.

4-56. ENGINE LUBRICATION SYSTEM.

4-57. ENGINE OIL (see figure 4-20).

4-58. Engine lubrication oil should be kept up to the FULL mark on the dipstick. To accurately check the oil level, stop the engine and allow approximately five minutes for the oil to drain off of engine internal parts. This eliminates the possibility of overfilling. The oil should generally be changed every 100 hours or two weeks, or more often where adverse

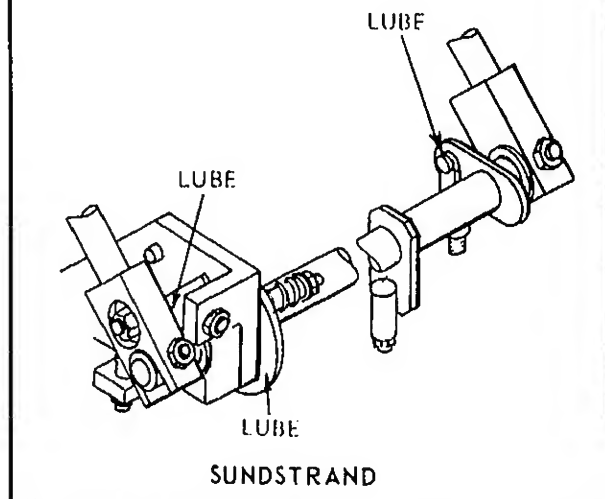


FIGURE 4-21. LUBRICATING THROTTLE AND TRANSMISSION LINKAGE.

conditions prevail. Color cannot be relied upon as indicating the need for an oil change. The use of an oil analysis service is the only reason for not following the change interval specified in Table 4-1. When checking the oil level, make sure that the area around the dipstick and filler cap are clean before removing them.

4-59. ENGINE OIL FILTER (see figure 4-20).

4-60.

The Detroit Diesel oil filter should be changed each time the oil is changed. Clean the outside of the filter flange to prevent dirt from entering the engine. Be sure that a new HYSTER-APPROVED filter and gasket are installed.

NOTE: The steering system and the hydrostatic transmission system share a common reservoir (located under the right hand operators seat).

4-64. FILLING THE TANK.

4-65. Check the oil level when the hydraulic system is cold and with the steering cylinder fully extended. The oil in the hydraulic tank should be visible through the sight gauge or slightly above gauge level when the oil is cold. Add oil when no longer visible in the sight gauge until oil fills the sight gauge window.

CAUTION: Do not completely fill the tank with oil. Air space is designed into the tank for expansion at warm temperatures. Pressurization will occur in the tank at operating temperature. No attempt should be made to vent the hydraulic system.

4-66. CHANGING THE HYDRAULIC OIL.

4-67. After each 1,000 hours of operation or yearly (whichever occurs first), the hydraulic oil should be drained from the tank and replaced with new oil. This removes dirt, water and mechanical wear particles that have accumulated in the tank. Also, the chemical structure of the oil deteriorates after prolonged use.

4-68. Drain the oil by removing the drain plug at the bottom of the tank. Fill the tank through the filler neck shown in figure 4-22.

CAUTION: Make absolutely sure that the oil level can be seen in the sight gauge before starting the engine and operating the steering or hydrostatic transmission systems.

4-69. TRANSMISSION HYDRAULIC FILTERS.

4-70. The suction filter should be checked every 100 hours of operation or at two week intervals by noting the reading on the vacuum gauge. Change the filter element if the reading exceeds 9 inches of mercury with oil temperature at 100°F and engine at high idle. Always replace the suction filter element at least once a year or 1,000 hours, whichever occurs first.

NOTE: Removal of hydraulic lines or hoses is not required for replacement of the element.

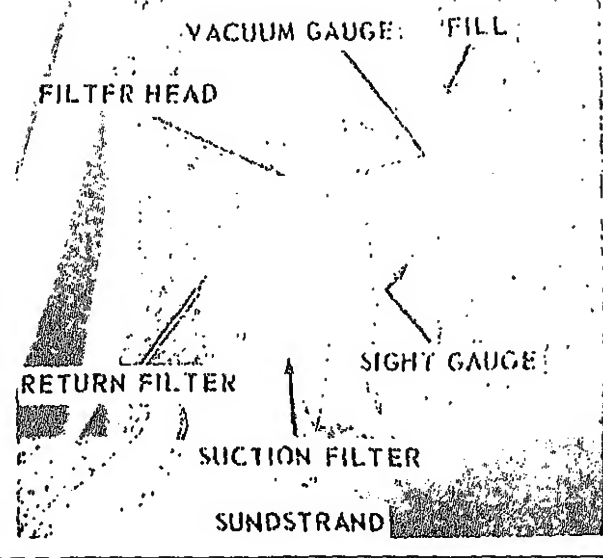


FIGURE 4-22. SERVICING THE HYDRAULIC SYSTEM.

4-61. LUBRICATION THROTTLE AND TRANSMISSION LINKAGE (see figure 4-21).

4-62. Place a few drops of engine oil on the detent plate and crank arm connections every 100 hours of operation or at two week

the bottom of the bowl.

b. Remove and discard the element. Inspect filter head o-ring and bowl gasket. Replace if necessary.

c. Wipe the bottom section of the filter head using a clean, lint-free cloth. Install a new o-ring in the filter head if required. Use a light film of grease to hold the o-ring in place if necessary.

CAUTION: Do not use lint-type cloth to clean hydraulic components. Lint deposits can affect the operation of the system.

d. Install a new element in the filter bowl.

CAUTION: Use only HYSTER-APPROVED filter elements.

e. Screw the assembled filter bowl into the filter head. When tightening the center post, hold the bowl from turning because it may stretch the o-ring out of shape and cause suction leakage. Tighten the center post to a maximum of 20 ft.-lbs.(2.8 kg-m).

4-71. The throw-a-way return filter should be replaced at 1,000 hours of operation or every year, whichever occurs first. Always change the return filter if the suction filter is replaced.

a. Unscrew the filter from the filter head and discard the filter.

b. Wipe bottom of the filter using a clean, lint-free cloth.

CAUTION: Use only HYSTER-APPROVED filters.

c. Apply a film of oil or grease to the new filter gasket (integral with filter).

d. Hand turn the filter into the filter head until the gasket just makes contact. Then tighten one-quarter turn only.

4-74. WATER SPRAY SYSTEM.

4-75. FILTERS (see figure 4-23).

4-76. The non-corrosive sump filter normally requires no maintenance because of the self cleaning action of the water washing back and forth in the tank. If excessive foreign material accumulates in the tank, the filter and the tank will need cleaning. The filter can be inspected by removing the tank access plate.

4-77. The tank inlet screen filter should be periodically cleaned when the water does not readily pass through. The screen lifts out of the tank freely after snap ring is removed.

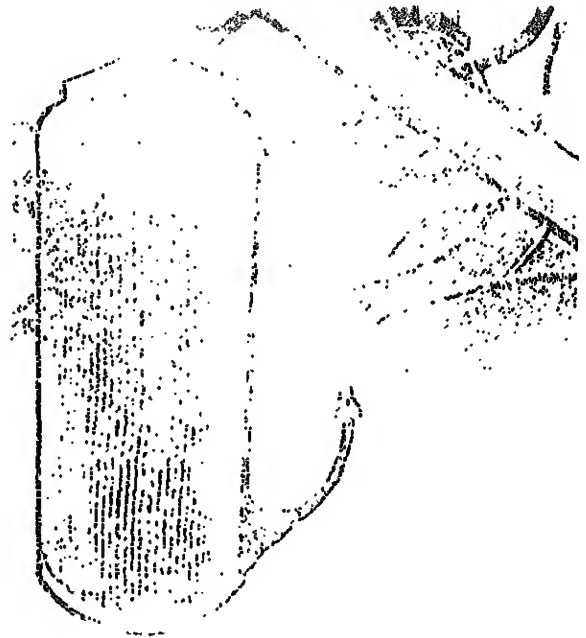


FIGURE 4-23. WATER FILTER

4-78. MANIFOLD AND NOZZLES (see figure 4-24).

4-79. The nozzles are mounted so they receive water from the center of the manifold tube where corrosion and sediment are minimized. This eliminates most of the nozzle plugging problems. Periodically the end caps on the water spray manifold should be removed and the sediment blown from the manifold.

4-80. STORAGE.

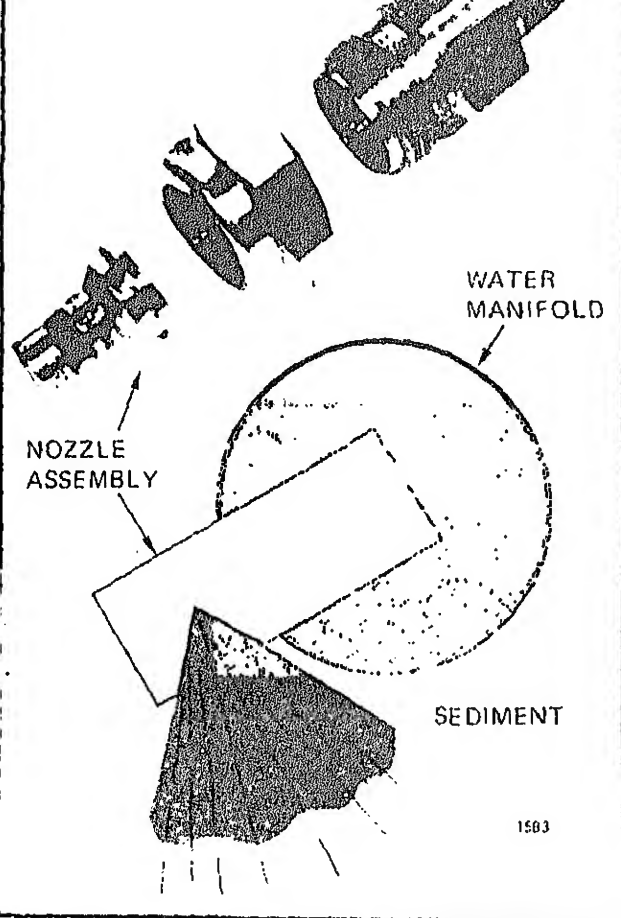


FIGURE 4-24. CLEANING MANIFOLD AND NOZZLES.

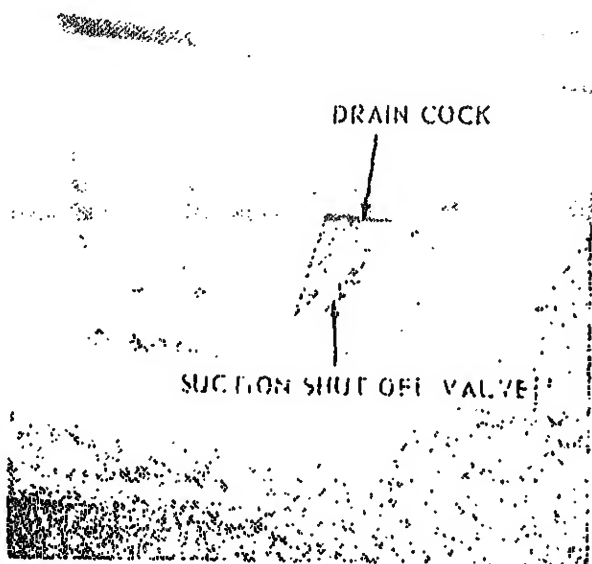


FIGURE 4-25. PUMP DRAIN COCKS.

the tank. Be sure to open the pump drain cock (see figure 4-25). The suction shutoff valve should be open when draining the pump so all the water from the suction side is removed. Water in the pressure side of the system should be blown out with compressed air.

4-82. **PARKING BRAKE** (see figure 4-26).

4-83. **LUBRICATION.**

4-84. The parking brake lever assembly should be lubed after each 100 hours of operation or every two weeks. This will prevent the adjusting threads from rusting.

4-85. **ADJUSTING.**

4-86. The parking brake lever should be adjusted sufficiently to require at least 80 pounds (36.3 kg) to pull it into the brake applied position. Twist the end of the brake lever clockwise (lever in brake off position) to increase force required to apply the brake.

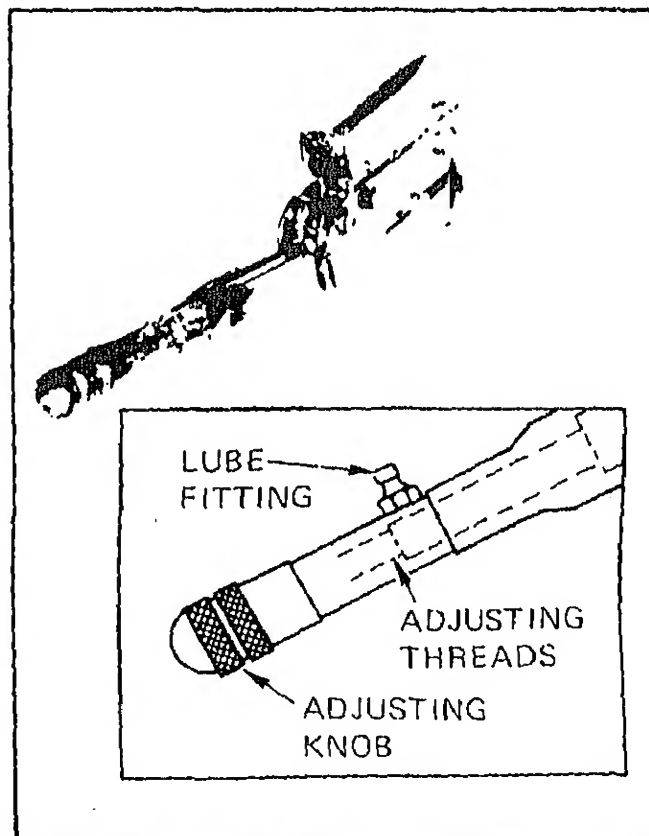


FIGURE 4-26. PARKING BRAKE LEVER MAINTENANCE.

figure 4-27).

4-88. CHECKING LUBRICANT LEVEL.

4-89. Model C350B has a fill-and-check plug as described in paragraph 4-90.

4-90. On model C350B, the small pipe plug located on the left-hand side of the drive drum communicates with the final drive compartment. The correct lubricant level of the final drive compartment can be checked by rotating the plug to its high extreme. Then slowly rotate the drive drum until the bottom of the

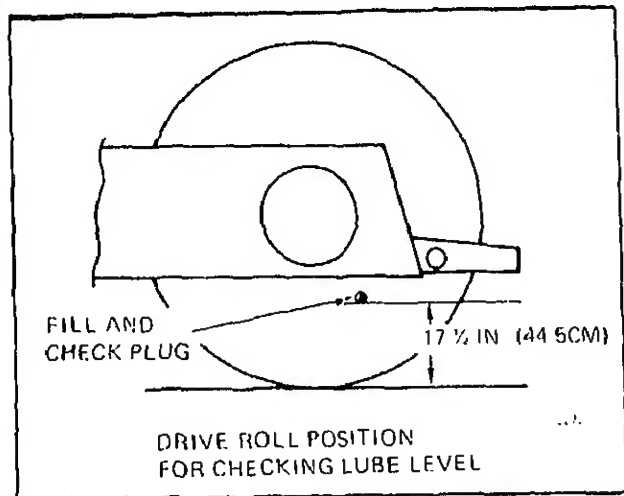


FIGURE 4-27A. SERVICING C350B FINAL DRIVE ASSEMBLY.

remove the plug. If the lubricant level is low, remove the filler hole, turn the drum until the hole is again at its high extreme and add two (1.9 ltr) of specified lubricant. Refer to 4-1 for lubricant type. Recheck lubricant level. Replace and tighten the plug.

4-92. FLUSHING THE FINAL DRIVE MECHANISM.

4-93. Each 1,000 hours of operation, or at the end of the final drive mechanism should be flushed to remove the old lubricant and accumulated foreign material. Drain the mechanism by removing the drain plug with the correct size key. Turn the hole at its extreme low. After all the oil has drained out, rotate the hole to its high extreme. Add 4 quarts (3.8 liters) of diesel fuel. Remove the plug. Rotate the drum one and a half revolutions so the plug ends up at its low position. Remove the plug and allow all diesel fuel to drain prior to filling with fresh lubricant.

4-94. STEERING.

4-95. GUIDE ROLL AXLE BEARINGS (see figure 4-28).

4-96. The guide roll bearings should be lubricated daily with multipurpose grease. There are two grease fittings, one on each side of the guide roll shaft. Apply pressure grease into the grease fittings until most of the old grease around the seal is observed.

4-97. TRUNNION ASSEMBLY (see figure 4-29).

4-98. The kingpin and oscillator shaft should be repacked yearly.

NOTE: Refer to Section 9 of the SERVICE MANUAL, part number 9-1, for the detailed procedure for disassembling and assembling trunnion components.

main frame.

- b. Remove oscillator shaft assembly.
- c. Clean, inspect, and re-pack kingpin and oscillator shaft bearings.
- d. Install oscillator shaft bearings and new

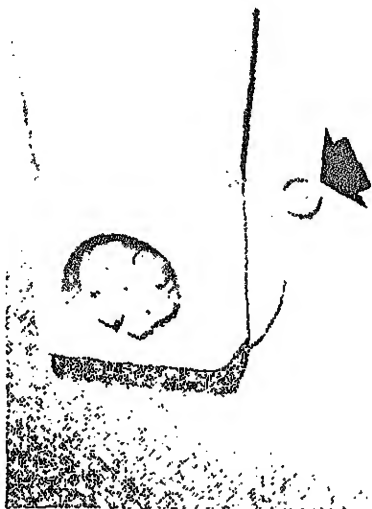
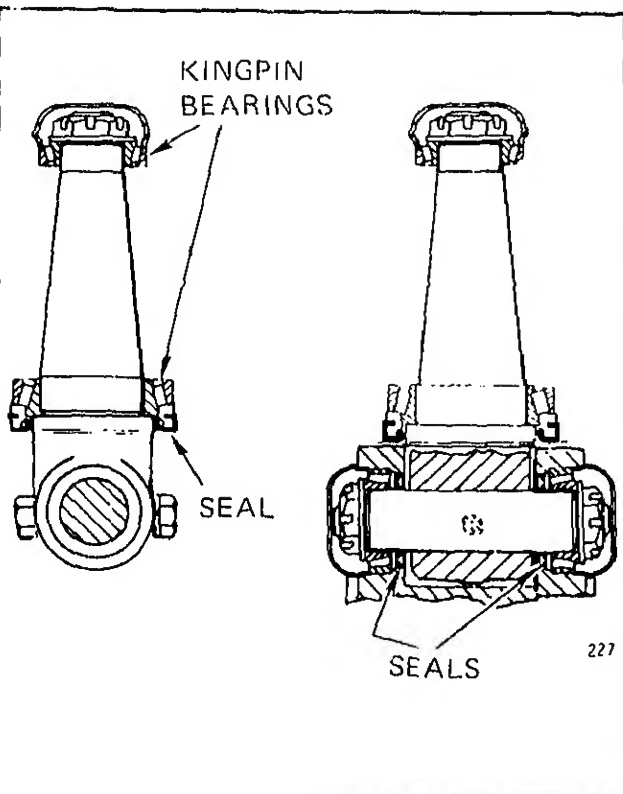


FIGURE 4-28. LUBRICATING GUIDE ROLL AXLE BEARINGS.



tions listed in Section 2.

CAUTION: Use only HYSTER-APPROVED parts

- e. Install kingpin bearings and lower seal.
- f. Install trunnion assembly into the frame and torque bearing retainer nut to the specification listed in Section 2.

4-99. STEERING CYLINDER BALL JOINTS (see figure 4-30).

4-100. The steering ball joints should be re-packed yearly.

- a. Remove rubber dust covers.
- b. Disassemble the ball joint on each end of the cylinder.
- c. Clean and inspect components.
- d. Pack each ball joint assembly with multi-purpose grease.
- e. Reassemble the ball joints and adjust so there is no end play.
- f. Install rubber dust covers.

CAUTION: Damaged dust covers will not keep out contaminants. Replace with HYSTER-APPROVED parts if original dust covers are damaged.



4-102. The steel ballast can be removed to provide access to the lower engine compartment.

WARNING: Always support ballast securely when removing or installing cap-screws.

4-103. UNIT STORAGE.

4-104. To prevent deterioration of components the following precautions should be taken when storing the roller for any length of time.

4-105. WATER SPRAY SYSTEM.

4-106. Drain the entire water spray system to prevent freezing of water and the resulting damage to components. A drain hole is provided in the tank bottom left corner to drain the tank. Be sure to open the pump drain cock (see figure 4-25). The suction shut-off valve should be open when draining the pump so all water from the suction side is removed. Water in the pressure side of the system should be blown out with compressed air. Cap or tape the nozzles and coat the tank fill cap threads with grease.

4-107. DRUM BALLAST.

4-108. If water ballast is being used in the guide rolls and drive drum, this water should be drained before storing. Rotate each drum until the ballast plug (largest plug) is at its low extreme when draining. Replace the drain plugs for storage.

4-109. STEERING CYLINDER.

4-110. After the roller has been positioned for storage, turn the steering wheel to provide minimum steering cylinder rod exposure. This will prevent rusting of the sliding contact surface of the rod. Coat the cylinder rods and control valve spools with a heavy grease.

4-111. FUEL SYSTEM.

4-112.

Diesel fuel will leave a waxy substance that plugs the system. If the unit is placed in storage for any appreciable length of time, all fuel should be drained from the tank and the

4-114. When storing the unit, the engine cooling system should be protected against freezing. This can be done by either draining the system or adding one of the various anti-freeze mixtures. To drain the system, open the stop cocks on the bottom of the radiator and the side of the engine (see figure 4-16). When using anti-freeze, drain the system and add an anti-freeze of ethylene-glycol base (Preston, Permaguard, Zerex, etc.). Test the anti-freeze solution to determine the freezing point. Record this information on a tag and attach it to the radiator overflow pipe.

4-115. ENGINE CYLINDERS.

4-116. Over a long period of storage, the cylinder walls may rust due to moisture condensation within the cylinder. To prevent rusting of cylinder walls, the or fuel injectors should be removed and a small amount of engine oil squirted into each cylinder. Turn the engine over several times with the starter to spread the oil on the entire cylinder wall. Replace the or fuel injectors. Repeat this procedure prior to starting after storage.

4-117. BATTERY.

4-118. A fully charged battery will maintain itself for a long period of time if kept cool and disconnected. The electrolyte in the battery should be checked periodically to insure a proper level. If it is low, add clean drinking water until proper level is obtained. Check the electrolyte specific gravity periodically and recharge the battery as necessary. This is especially important if freezing temperatures are expected. Clean and dry the battery, especially the terminals. Coat the terminals with **HYSTER-APPROVED** battery terminal coating to prevent corrosion.

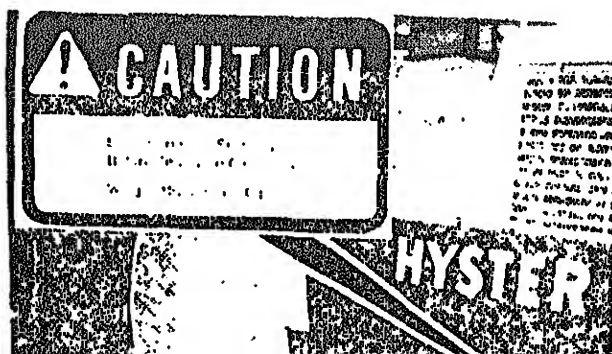


TABLE 5-1. TROUBLE ANALYSIS FOR WATER SPRAY SYSTEM.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Spray Motor Will Not Operate.	Toggle switch open.	Replace switch.
	Circuit breaker not re-setting.	Replace breaker.
	Motor brushes worn excessively.	Replace brushes.
Spray Motor Will Not Turn Off.	Toggle switch shorted.	Replace switch.
Pump Operates But There Is Little Or No Spray Pattern.	Insufficient liquid in reservoir.	Replenish liquid supply.
	Water filter plugged.	Clean water filter and tank.
	Spray nozzles plugged.	Clean nozzles and nozzle manifold.
	Pump housing cracked from freezing.	Replace pump.
Spray Pattern Not Completely Covering The Drum(s).	Spray angle incorrect.	Adjust nozzle manifold so spray pattern completely covers drum. R to the water spray section.
	One or more nozzles plugged.	Clean nozzle(s).
	Charging system malfunctioning (low voltage to motor).	Check charging system.

TABLE 5-2B. TROUBLE ANALYSIS FOR SUNDSTRAND HYDROSTATIC TRANSMISSION

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Unit Will Not Operate In Either Direction.	Transmission by-pass valve open.	Close valve. Refer to Section 3.
	System low on oil.	Check oil level at sight gauge on side of unit. Replenish with approved oil listed in Section 4. Locate and repair leaks causing loss of oil.*
	Faulty control linkage to pump.	Check the linkage from control levers to pump arm to make sure it is connected and free to operate. Refer to Section 7 for adjustment procedure.
	Faulty control linkage inside pump.	Refer to Section 7 for pressure check procedure.
	Low or zero charge pressure.	Refer to Section 7 for pressure check procedure.
	a. Charge pressure relief valves in charge pump or motor manifold damaged or stuck open.	Refer to Section 7 for replacement of charge pressure relief valve.
	b. Suction filter or hose from tank to charge pump clogged.	Service filter, flush suction line from tank to charge pump. Refer to Section 7 for replacement of charge pump.
	c. Charge pump drive shaft sheared.	Replace the charge pump.
	d. Internal damage to pump or motor.	Refer to Probable Cause "Internal damage to pump and motor."
	e. Cold or improper oil.	Refer to Section 4 for approved oil.

*Refer to manufacturer's warranty policy.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Unit Will Not Operate In Either Direction (Cont.)	<p>Low and fluctuating charge pressure.</p> <ul style="list-style-type: none"> a. Air in system. b. Charge pressure relief valve in the motor manifold stuck open. c. Internal damage to pump or motor. <p>Defective charge check valves.</p> <p>Defective high pressure relief valves at motor manifold.</p> <p>Internal damage to pump or motor. Indicated by:</p> <ul style="list-style-type: none"> a. Low, zero or rapidly fluctuating charge pressure. b. Operating pressure in forward or reverse is less than high pressure relief setting. Charge pressure lower than normal, may drop to zero when high pressure is reached. c. Noisy pump or motor. d. Pieces or flakes of brass in tank or filters. 	<p>Refer to Section 7 for proper pressure check procedure.</p> <p>Check all fittings, especially around filter, in the suction line and locate point or points where air is being drawn into the system. Tighten fittings where air leaks exist.</p> <p>Free-up or replace charge pressure relief valve. Refer to Section 7 for replacement procedure.</p> <p>Replace with new or overhauled pump and motor. Refer to Section 7.</p> <p>Check operation in both directions to determine which check valve is defective.</p> <p>Refer to Section 7 for pressure check procedures. Examine both relief valves. Clean and replace if defective. Do not attempt to shim valves.</p> <p>NOTE: Indications a, b and c may be corrected by minor repair procedures. Refer to Section 7 for hydrostatic system checks and adjustments before removing pump or motor. If internal failure is certain, replace with a new or overhauled pump or motor.*</p> <p>d. Replace pump or motor with a new or overhauled pump or motor.*</p> <p>NOTE: If either unit is considerably worn or damaged, carefully check and clean the other unit (pump or motor). Refer to Section 7 for system start-up procedures.</p>
Unit Operates In One Direction Only.	Faulty control linkage to pump.	Check the linkage from control levers to pump arm to make sure it is connected and free to operate. Refer to Section 7 for adjustment procedures.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Unit Operates In One Direction Only (Cont.)	Faulty high pressure relief valve.	Refer to Section 7 for pressure check procedures.
	Charge check valve faulty.	Replace and check pressure.*
	Defective control valve.	Replace and check pressure.*
Neutral Difficult Or Impossible To Find.	Faulty controls or linkage to pump.	Refer to Section 7 for adjustment procedures.
	Oil level low.	Check oil level at sight gauge on tank. Replenish tank with approved oil listed in Section 4.
System Operating Hot.	Oil cooler clogged.	Clean oil cooler air passages.
	Oil cooler being bypassed.	Inspect cooler bypass valve. Clean or replace. Arrow on valve should point up in the line to the return manifold.
	Clogged filters or suction line.	Service suction or return filters. Clean or replace line from tank to charge pump.
	Internal leakage (usually accompanied by loss of acceleration and power). a. High pressure relief valves stuck partially open.	Refer to Section 7 for pressure check procedures. If the operating pressure is 200 PSI (14 kg/cm ²) or more, lower pressure in one direction, switch the high pressure valves. If the lower pressure is still high, switch the valves to the opposite side of the circuit, do not attempt to shim valve. Replace the valve.
System Operating Hot. (Cont.)	b. Internal parts of pump or motor (or both) worn.	Refer to Section 7 for pressure check procedures. Replace defective pump or motor. NOTE: If either unit is considered worn or damaged, carefully check and clean other unit (pump or motor).
System Noisy.	Air in system. a. Low oil level.	Check oil level at sight gauge on tank. Replenish with approved oil listed in Section 4. Locate and fix leak causing loss of oil.

*Refer to manufacturer's warranty policy.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
System Noisy (Cont.) Acceleration and Deceleration Sluggish.	b. Line or filter leaks (considerable amount of foam in the tank).	Check suction filter and suction line between tank and charge pumps for leaks allowing air to enter into system. Replace defective hose and/or tighten fitting.
	Hosing or tubing not properly insulated.	Make sure hose or tubing is not touching any metal that can amplify natural hydraulic system hum.
	Air in system.	Refer to "System Noisy" air in system.
	Low charge pressure.	Refer to "System Will Not Operate In Either Direction." Low or zero charge pressure.
	Control orifice plug partially blocked.	Refer to Section 4. Replace suction filter more often.
	Internal wear or damage.	Refer to "Unit Will Not Operate In Either Direction." Internal damage to pump or motor.
	Engine lugs down.	Refer to engine manufacturer's service manual.

*Refer to manufacturer's warranty policy.

TABLE 5-3. TROUBLE ANALYSIS FOR FINAL DRIVE ASSEMBLY.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Unit Will Not Move.	Control linkage to transmission.	Adjust. Refer to Section 7
	Transmission bypass valve open.	
	Broken drive shaft.	
	Planetary gears jammed.	Remove final drive from unit for complete teardown and inspection. Check all parts for damage. Replace as needed. Check alignment of components. Refer to Section 8.
	Parking brake not releasing.	Inspect for jammed linkage or material

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Noisy Final Drive.	Dry or defective bearings.	Remove final drive assembly from a housing. Disassemble as needed to check for damaged parts. Replace as needed (refer to Section 8). Assemble and fill with proper lubricant (refer to Section 4).
	Incorrect bearing adjustment.	Adjust the motor carrier bearing pressure. Refer to Section 8.
	Worn or broken planetary gear teeth.	Replace parts as needed. Check for use of proper lubricant (refer to Section 4). Install gears as specified in Section 8.
	Incorrect or lack of lubricant.	Fill with correct lubricant as specified in Section 4.
Losing Lubricant.	Worn brake shaft seal.	Replace seal. Lubricate before installation.
	Defective motor housing gasket.	Replace gasket. Fill final drive as specified in Section 4.
	Incorrect lubricant.	Drain lubricant. Refill as specified in Section 4.
	Over-filling.	Drain to correct level. Refer to Section 4 for filling instructions.
	Operating on side slope.	Operate the unit up or down the grade.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
GEAR PUMP (Detroit Diesel Only)		
Pumping Not Delivering Fluid.	Drive shaft sheared.	Remove and disassemble the pump. Inspect and replace worn or broken parts.
	Air leaks at the intake.	Check the inlet connections to determine where air is being drawn in. Tighten any loose connections. Replace seals where necessary.
	Fluid intake hose in reservoir restricted.	Remove and flush or replace suction hose between the pump and tank. Service transmission filters if necessary.
	Gears worn or broken.	Replace parts as necessary.
Insufficient Pump Pressure.	Insufficient relief pressure.	Check relief valve in the flow divider for contamination. Clean or replace.
	Worn parts causing internal leakage of pump delivery.	Inspect and replace as necessary.
	Damage to cylinder packing.	Refer to "Steering Cylinder Troubles".
Pump Making Noise.	Pump intake partially blocked.	Remove and flush or replace suction line between pump and tank. Check the fluid condition and, if necessary, drain and flush the system. Refill with clean fluid.
	Air leaks at the intake or shaft seal. (Oil in tank may be foamy.)	Check the inlet connections and seal to determine where air is being drawn in. Tighten any loose connections and replace if necessary.
	Air in circuit.	Check all connections for tightness.
	Dirt and sludge in the pump.	Disassemble the pump and clean all parts. Drain the hydraulic tank and flush. Replace with the proper oil as specified in Section 7.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
STEERING CONTROL UNIT (Handpump)		
No Response When Steering Wheel Is Turned Slowly.	Dirt in hydraulic system.	Drain and flush complete hydraulic system. Change transmission suction and return filters. Refill system with specified hydraulic fluid. Refer to Section 4.
	Oil level too low.	Fill to sight gauge on tank. Refer to Section 4 for specified hydraulic fluid.
Slow Or Hard Steering.	Oil level low.	Fill to sight gauge on tank. Refer to Section 4 for specified hydraulic fluid.
	Clogged line.	Check lines. Clean and replace as required.
	Dirt in hydraulic system.	Drain and flush complete hydraulic system. Change transmission suction and return filters. Refill system with specified hydraulic fluid. Refer to Section 4.
	Worn sleeve and spool.	Replace sleeve, spool and housing as a unit.
	Worn metering gear.	Replace both sets of metering gears.
	Malfunction of double vane hydraulic pump.	Refer to troubleshooting – Gear Pump.
	Manual steering check ball off its seat.	Replace spring and ball. Check seat.
Steering Wheel Does Not Center.	Broken centering springs.	Replace all springs (6). Refer to Section 9.
Continuous Steering Wheel Rotation.	Broken centering springs.	Replace centering springs (6). Refer to Section 9.
	Burr on sleeve and spool.	Remove burr with 600 grit abrasive paper on a flat surface. Remove sharp edges from abrasive paper to prevent scratches.
	Dirty fluid.	Drain and flush complete hydraulic system. Change suction and return filters. Refill system with specified hydraulic fluid. Refer to Section 4.
No Response.	Pump failure.	Refer to troubleshooting –

TABLE 5-4. TROUBLE ANALYSIS FOR STEERING SYSTEM (CONT.).

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
STEERING CONTROL UNIT (Handpump) (Cont.)		
No Response (Cont.)	Hoses clogged.	Replace or flush hoses.
Wrong Response To Steering Wheel.	Hose incorrectly installed.	Refer to Section 9 for hose routing.
	Metering star gear to slot in shaft misaligned.	Realign star gear and shaft. Refer to Section 9.
STEERING CYLINDER		
No Motion Of Hydraulic Cylinder.	No oil or insufficient oil being supplied to cylinder.	Check the hydraulic system for defective pump or pump drive, or pressure leak in lines, low low relief setting at pump. Replace defective unit.
Slow Cylinder Motion.	Insufficient oil being supplied to cylinder.	Check hydraulic system as described above.
	Worn cylinder-piston packing.	Replace packing.
Spongy Or Jerky Action.	Air in system.	Check reserve oil level, fill tank necessary. Check inlet side of vacuum leaks. Tighten connections. Bleed system. Refer to Section 9.
	Sticky relief valve.	Remove and check the relief valve. Repair or replace parts as necessary. If foreign particles are the cause of malfunction, check reserve oil for contamination. Whenever oil is contaminated, it should be replaced and the filter serviced. Make sure mating surfaces are mating properly.
	Bent or deformed cylinder-piston or rod.	Disassemble, check and repair assembly.

TABLE 5-5. TROUBLE ANALYSIS FOR BRAKE SYSTEM.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Parking Brake With	Contaminated brake shoes	Clean and replace brake shoes

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Parking Brake Applies But Will Not Hold.	Maladjusted. Grease or oil on lining. Worn lining. Cables on linkage seized.	Adjust. Refer to Section 10. Replace lining. Locate cause of contamination. Replace. Free-up or replace.
Parking Brake Will Not Release Or Drags.	Adjusted too tightly. Shoe retracting spring or linkage springs weak, broken or disconnected. Cable seized.	Adjust as specified in Section 10. Replace. Free-up or replace.

6-2. The electrical system consists of several subsystems, they are: starting circuit, charging circuit and the discharge circuit (gauges, lights,

system should be considered because interdependence. The electrical system specifications are given in Section 2, and a shooting guide is presented in Section

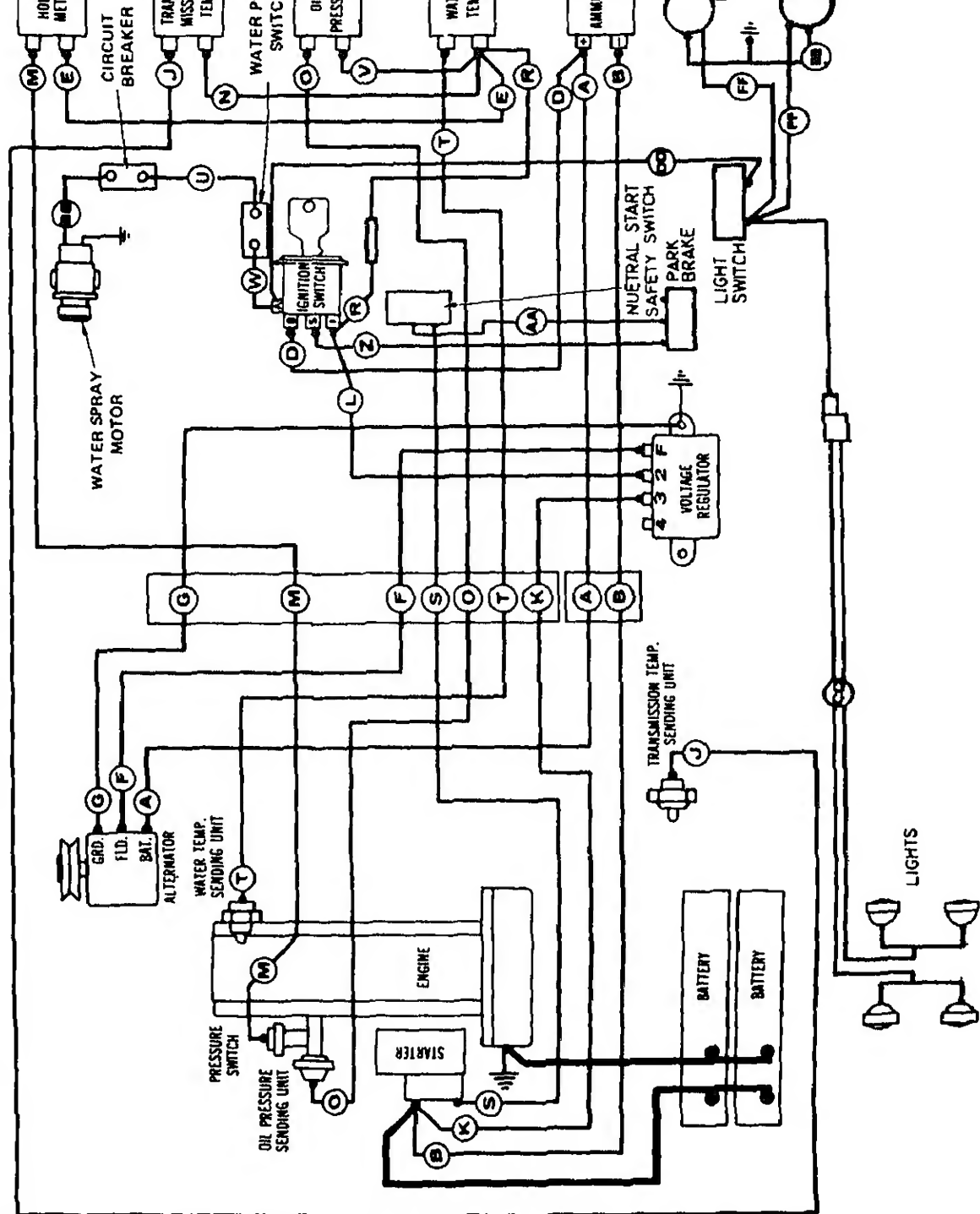
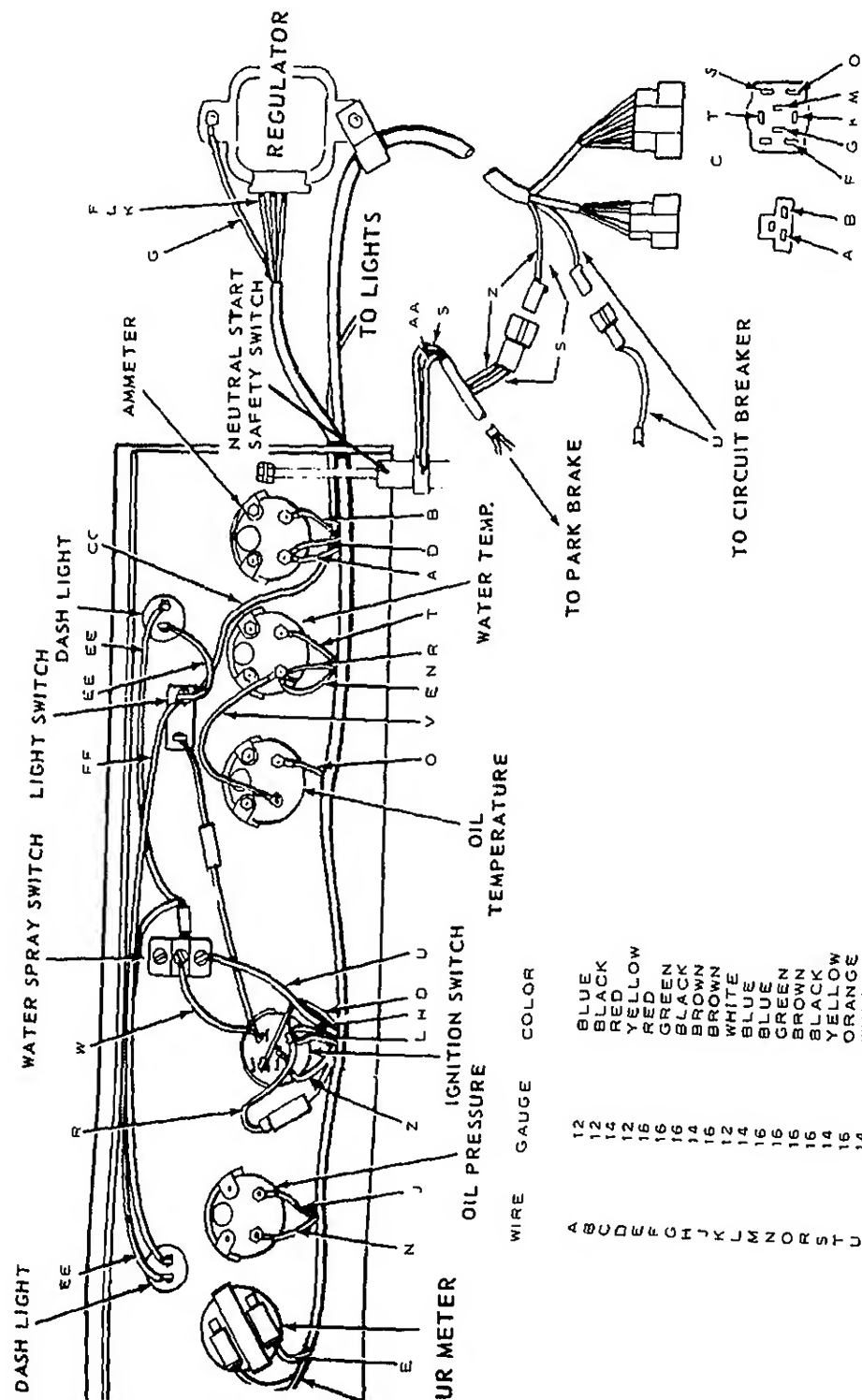


FIGURE 6-4. ELECTRICAL SCHEMATIC FOR DETROIT



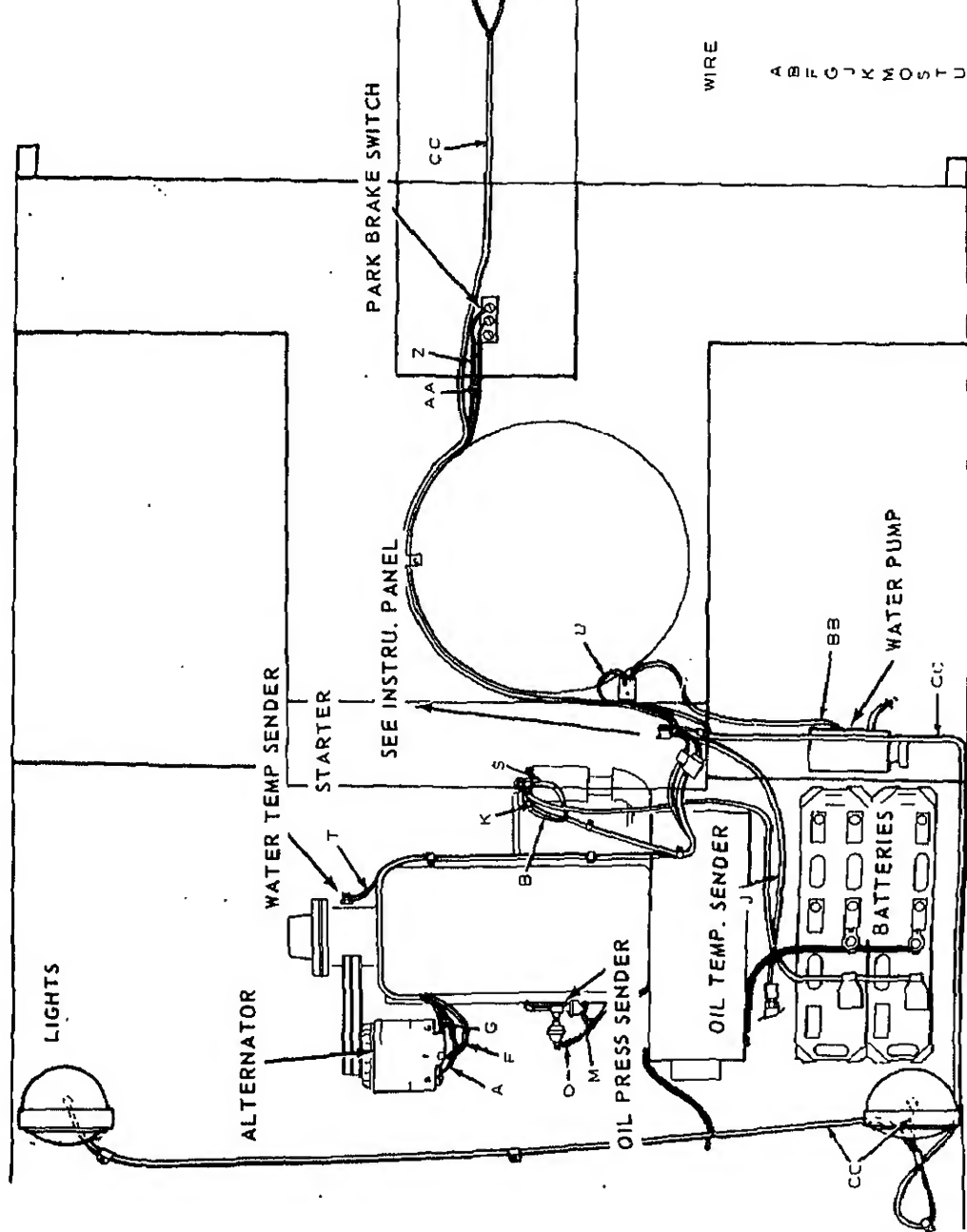
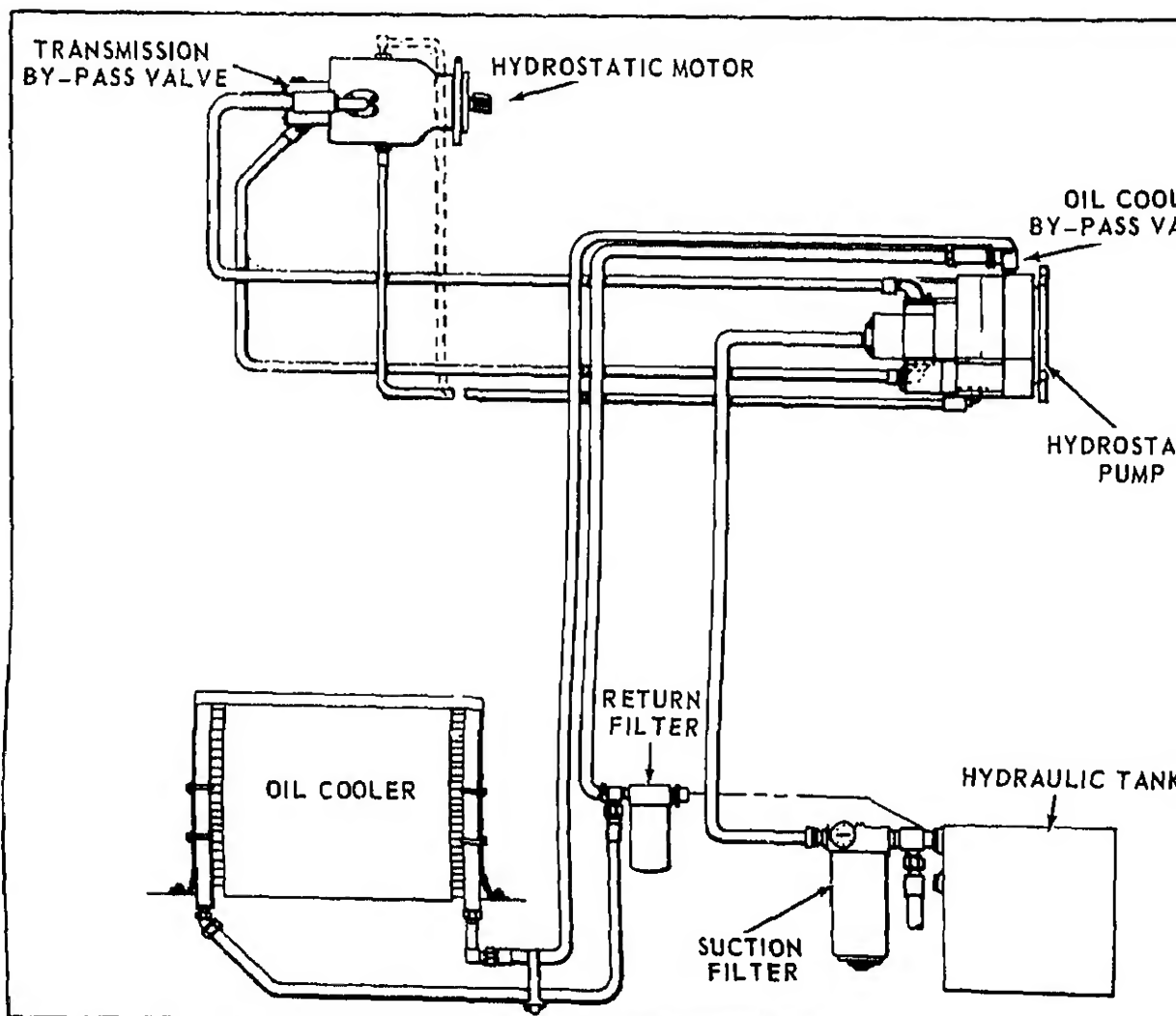


FIGURE 6-6. ROUTING DIAGRAM FOR DETROIT DIESEL ENGINE.

SEE FIGURE 6-4 FOR ELECTRICAL SCHEMATIC.



7-85. GENERAL.

7-86. This section contains a description of the Sundstrand hydrostatic transmission, transmission components and their function in their hydraulic circuits. Service instructions are given that include removal of components, disassembly, inspection, reassembly and installation procedures.

7-87. Checks and adjustments are presented in this section. Design and performance specifications are presented in Section 2. The troubleshooting guide is presented in Section 5.

7-88. HYDRAULIC SYSTEM (see figure 7-32).

7-89. The closed loop hydraulic system consists of two subsystems: the hydrostatic transmission subsystem and the steering subsystem. The two subsystems share hydraulic oil and hydraulic tank. These components are presented in this section. Refer to the steering section for the remaining coverage of the steering hydraulic components.

7-90. HYDRAULIC OIL.

7-91. Specifications for hydraulic oil are given in Section 2.

7-92. HYDRAULIC SYSTEM COMPONENTS (see figures 7-33, 7-34 and 7-35).

7-93. GENERAL.

7-94. The hydrostatic transmission offers infinite control of speed and direction. Control of the variable displacement, axial piston pump and the fixed displacement motor is the key to controlling the unit. When the variable pump swashplate is tilted, by movement of the Direction-Throttle Control Ball, a positive stroke to the pistons is created. This, at any given input speed, produces a flow from the pump. This flow is transferred through high-pressure lines to the motor. The ratio of the volume of flow from the pump to the displacement of the motor will determine the speed of the motor output shaft. Movement of the Direction-Throttle Control Ball to the opposite side of neutral causes the flow from the pump to reverse and the motor output shaft turns in opposite direction. Speed of the output shaft is controlled by adjusting the

conditions such as grade and ground conditions which establish the demand of the system. The pump and motor are contained in separate housings and are connected by high-pressure hoses. All valves required in the closed loop circuit are included in either the pump or motor assemblies. A reservoir, oil cooler and lines complete the circuit. Figures 7-33, 7-34 and 7-35 illustrate the system in neutral, forward and reverse modes.

7-95. CHARGE PUMP CIRCUIT.

7-96. CHARGE PUMP.

7-97. A charge pump is a part of the hydrostatic pump assembly. When the pump is running, the charge pump provides oil supply, cooling and pressure for the pump functions.

7-98. The charge pump draws oil from the hydraulic tank, through the suction filter, and supplies oil, under pressure, to the low-pressure side of the main circuit.

7-99. NEUTRAL CHARGE PRESSURE RELIEF VALVE.

7-100. When the transmission is in neutral, the charge pump pressure is controlled by the neutral charge pressure relief valve. This valve is an integral part of the charge pump assembly and no adjustments that can be made in the field. When charge pressure exceeds the rated pressure (190 to 220 PSI (13.36-15.47 kg/cm²)), in the pump case pressure, the neutral charge pressure relief valve opens allowing oil to flow from the pump case, oil cooler and hydraulic tank back to the hydraulic tank.

7-101. SUCTION FILTER.

7-102. A low-pressure filter is mounted in the hydraulic tank. It serves as the suction filter for the transmission inlet oil. It is a 10 micron filter. There is no by-pass valve on the suction filter.

7-103. COOLING CIRCUIT.

7-104. The cooling circuit maintains a constant oil temperature through the transmission for all operating purposes. Excess oil from the low-pressure relief valve enters the motor housing. Flow is then directed through drain lines in the pump housing. The circuit is completed by returning the oil from the pump housing through the oil cooler back to the hydraulic tank.

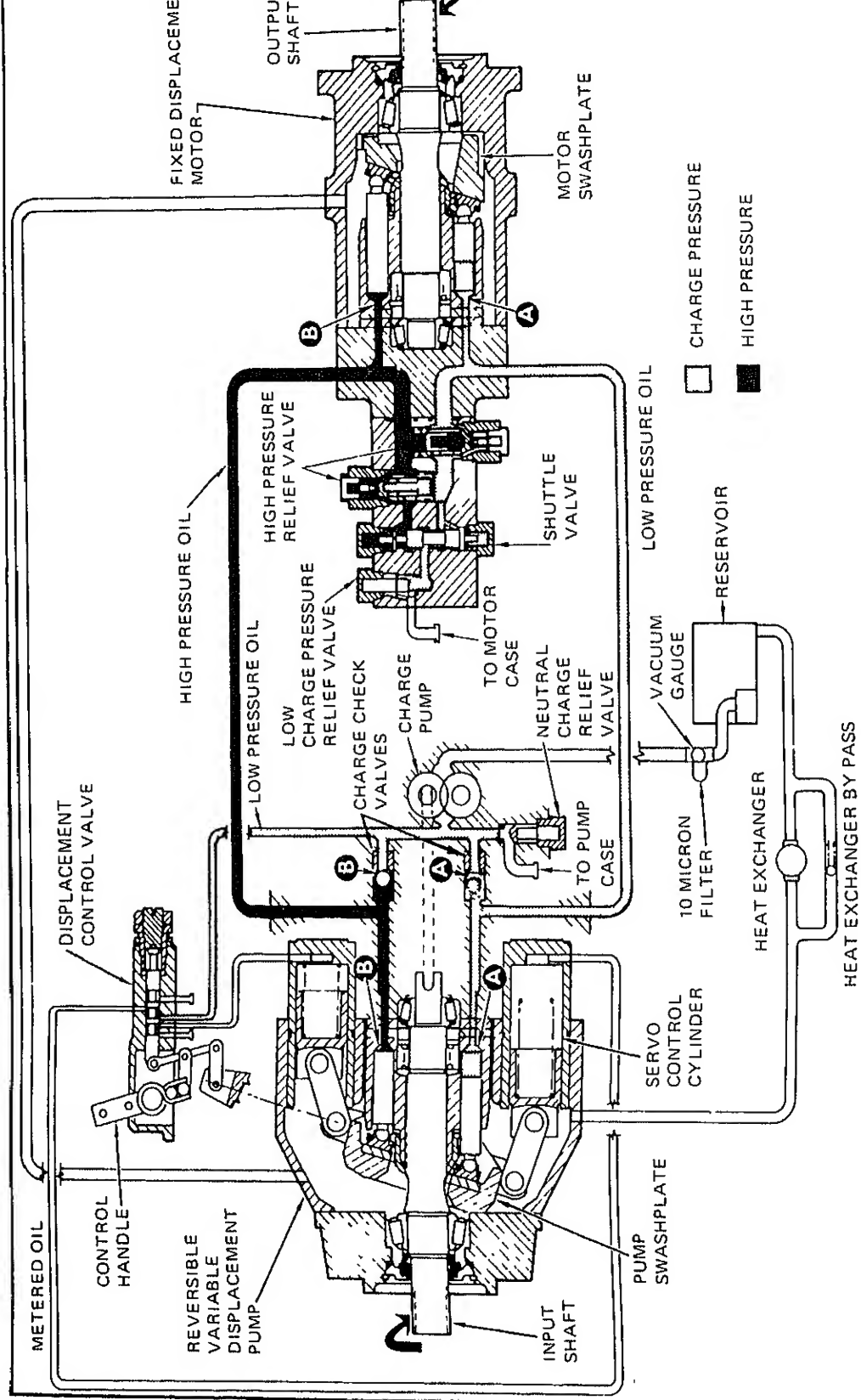
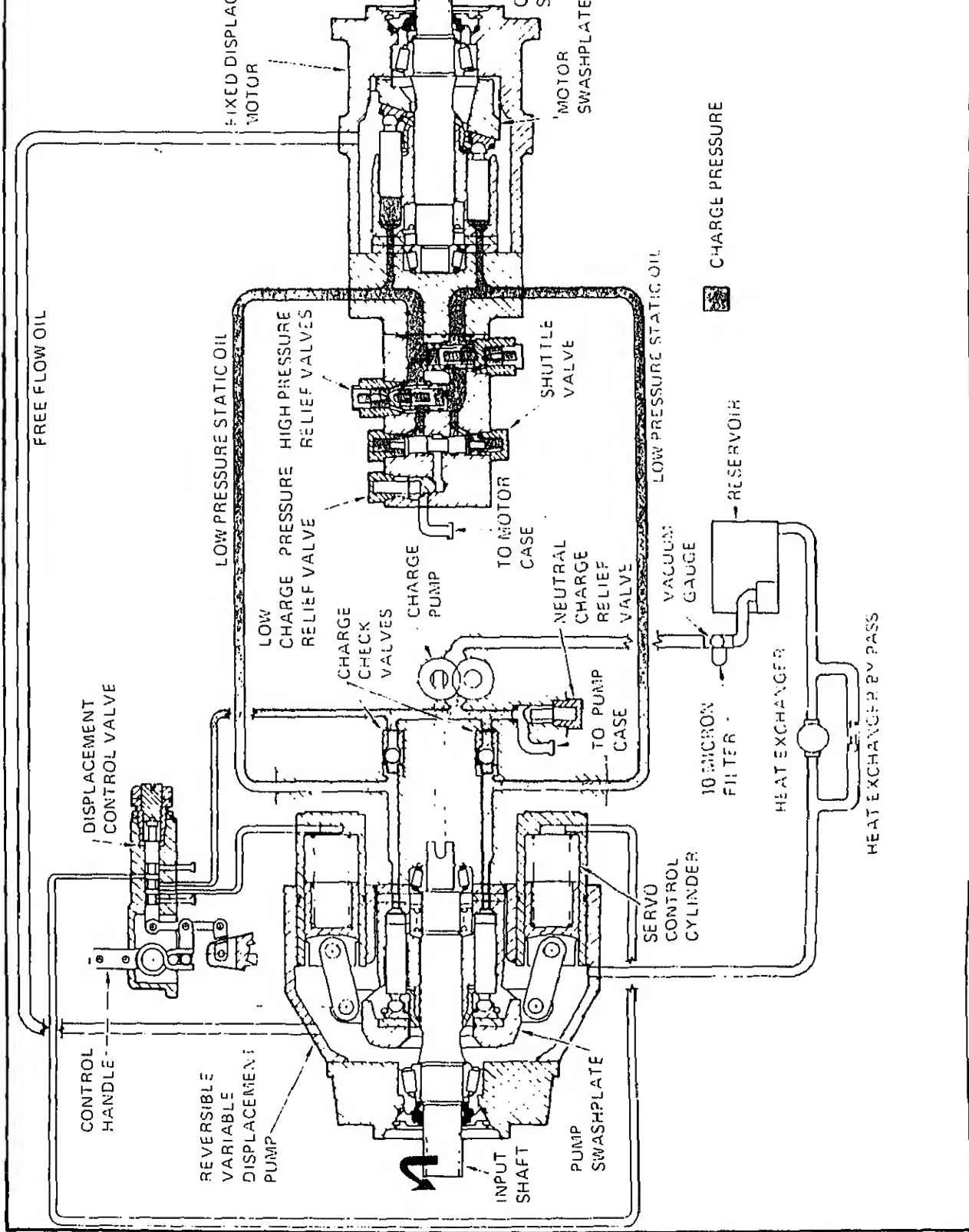
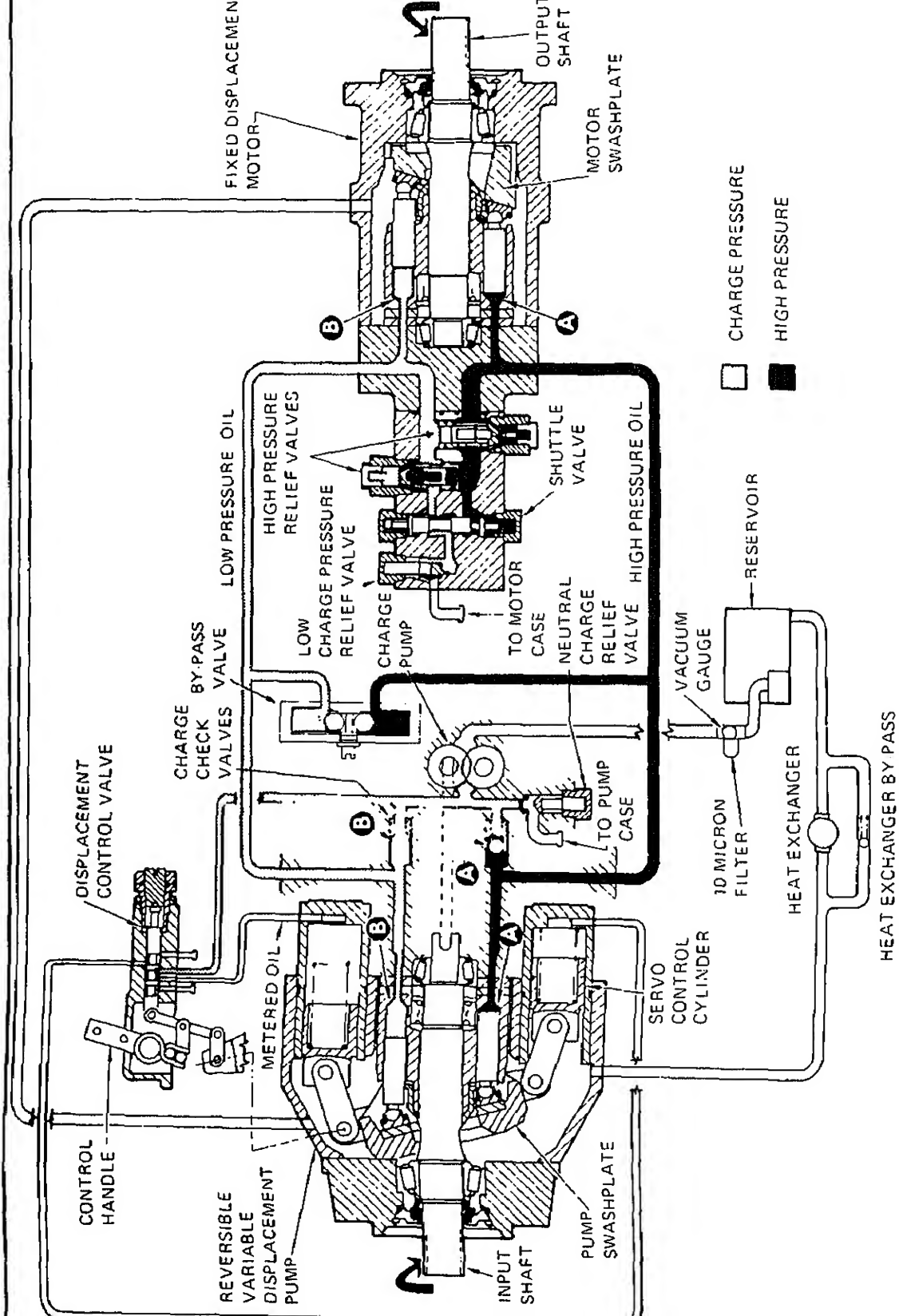


FIGURE 7-33. SUNDSTRAND TRANSMISSION IN FORWARD.





relief valve. Excess circuit flow in neutral is not admitted to the motor, but is directed to the pumps' drain circuit, through the oil cooler to the hydraulic tank.

7-105. OIL COOLER.

7-106. The oil cooler is mounted with the engine radiator. It is connected between the motor case drain port and the hydraulic tank. Excess cooling oil from the low-charge-pressure relief valve enters the motor case, then flows through the case drain line through the pump case to the oil cooler and the tank.

7-107. OIL COOLER BYPASS VALVE.

7-108. The oil cooler bypass valve prevents high back-pressure at the pump case. Back-pressure can result from cold fluid or a restricted oil cooler passage. The valve is set to open at 15 PSI (1.05 kg/cm²) pressure at normal operating temperature. During cold start conditions or if flow through the cooler becomes restricted, the valve opens to allow flow from the pump directly to the hydraulic tank.

shuttle valve prevents loss of high pressure when transmission is reversed.

7-111. CONTROL FUNCTION.

7-112. The charge pump provides oil under pressure to control valves.

7-113. MAKE-UP CIRCUIT.

7-114. The charge pump provides oil to the circuit to make up for internal leakage.

7-115. HYDROSTATIC PUMP ASSEMBLY.

7-116. The hydrostatic transmission employs a variable displacement hydraulic pump driving a fixed displacement hydraulic motor to transmit engine power to the final drive.

7-117. The hydrostatic pump assembly is attached to, and driven by, a hub assembly on the engine flywheel.

7-118. VARIABLE DISPLACEMENT HYDROSTATIC PUMP (see figure 7-36)

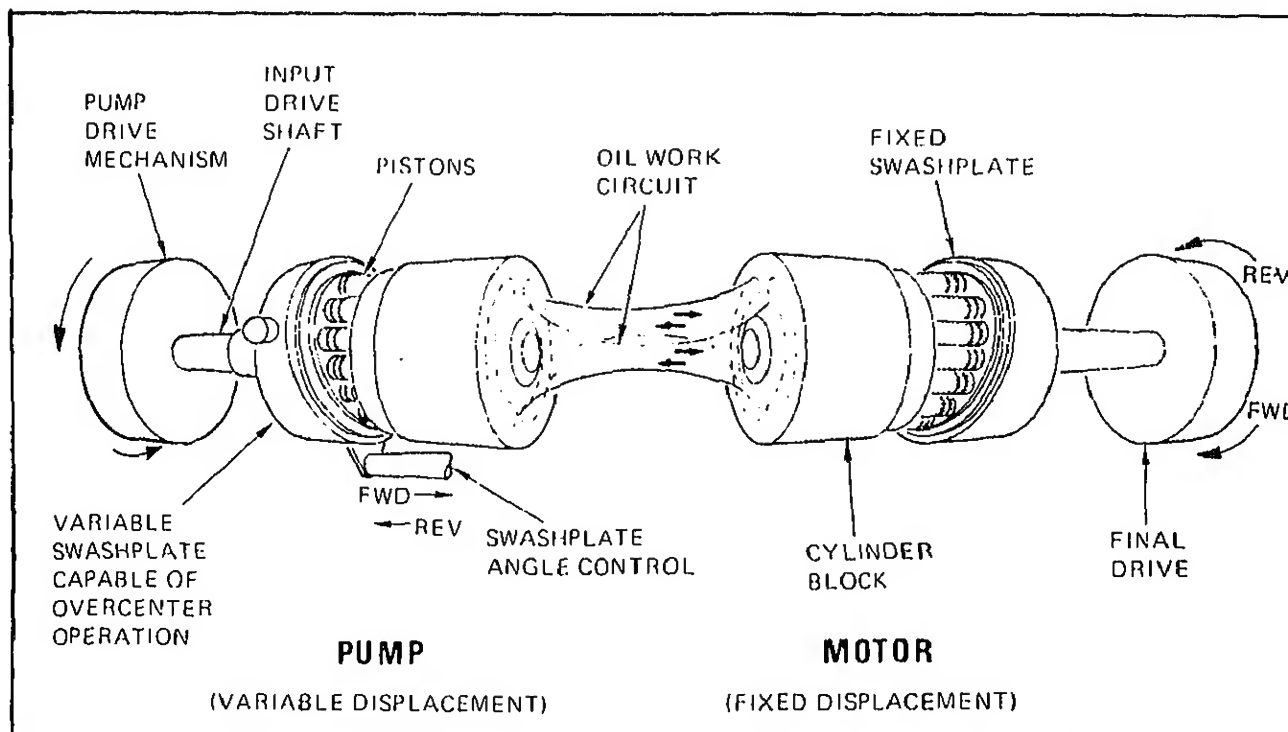


FIGURE 7-36.

pump consist primarily of a drive shaft, charge pressure relief valve, replenishing check valves, servo pistons, swashplate, cylinder block assembly and valve-bearing plate.

7-120. The pump drive shaft is splined into the center of the cylinder block. The cylinder block assembly contains nine (9) cylinder pistons. When the engine is running the cylinder block and pistons are always rotating.

7-121. Movement of the Direction-Throttle Control Bail causes the servo control circuit to act on the displacement control valves. These valves cause one or the other of the two (2) servo pistons to move the pump swashplate.

7-122. The pump swashplate can tilt either side of center. When the swashplate is exactly centered, the transmission is in neutral.

7-123. Each cylinder piston has a slipper plate at one end. The slipper retainer keeps all nine (9) slippers in contact with the thrust plate which contacts the swashplate. When the swashplate is centered, the cylinder pistons do not stroke in the cylinders. When the swashplate is tilted, the cylinder pistons stroke. The degree of tilt determines the volume (displacement) of oil pumped by each cylinder piston.

7-124. The valve-bearing plate contains elongated ports that are in contact with the cylinder block. The opposite side of the valve-bearing plate mates with the pump end cap. Two ports in the end cap are connected through high-pressure lines to a hydrostatic motor.

7-125. When the swashplate is tilted, each cylinder piston moves back and forth in its cylinder with each revolution of the cylinder block. When a piston rotates past the inlet ports in the valve-bearing plate, it moves out of the block and draws low-pressure oil into the cylinder. This is the intake stroke of the piston. Further rotation of the cylinder block moves the filled cylinders toward the outlet ports in the valve-bearing plate. They are forced into the cylinder block by the tilt of the swashplate. The oil under high pressure ports to the outlet port in the end cap through the valve-bearing plate. With the swashplate tilted to either side of center, one side will be forward vehicle motion with one main circuit line to the motor being high-pressure and the other being

reverses the high-pressure and returns oil to the main circuit lines.

7-126. When the transmission is in neutral, the swashplate in the hydrostatic pump is neutral and the cylinder pistons are not stroking. In this mode no oil is being pumped into the main circuit, therefore, the motor block assembly in the motor is stationary and the motor output shaft does not turn.

7-127. CHARGE PUMP.

7-128. A charge pump is a part of the hydrostatic pump assembly. When the engine is running, oil is being drawn from the tank through the suction filter by the charge pump.

7-129. CHECK VALVES.

7-130. There are two (2) check valves in the hydrostatic pump assembly. With the transmission in neutral, both check valves are open, allowing charge pressure to lubricate the system. With the transmission out of neutral, one of the valves will be closed and the other will be open. The valve on the high-pressure side of the main circuit will be held closed by the high-pressure. The other valve will allow oil to flow from the charge pump to the low-pressure side of the cylinder block assembly to maintain adequate oil in the loop.

7-131. SERVO CONTROL SYSTEM.

7-132. Control of swashplate angle (displacement) is accomplished in the hydrostatic pump by use of a powered servo system.

7-133. DISPLACEMENT CONTROL VALVE.

7-134. The Displacement Control valve assembly is a closed center four-way valve with the servo pressure ports exhausted at the neutral position. The valve is controlled through internal linkage connections with the swashplate and the external Direction-Throttle Control Bail.

7-135. To put the pump in stroke, the control handle moves the displacement control valve through a torsion spring. Once the swashplate angle is set, a feed-back link returns the displacement spool almost to neutral position, just enough oil to the servo cylinder to keep the swashplate at the proper angle.

is released, the displacement control spool tends to be returned to neutral by a spring.

7-137. SERVO CONTROL CYLINDERS.

7-138. The hydrostatic pump is equipped with two (2) servo cylinders. They are controlled by low-pressure oil directed from the displacement control valve.

7-139. When the pump is stroked, oil under charge pressure is ported to the servo cylinder. The piston moves the swashplate against the opposite servo spring. Both servo springs are constrained so that they can only force the swashplate toward neutral. When the swashplate has moved to the angle set by the control handle, the feed-back link returns the displacement control spool almost to neutral where it ports just enough oil to the servo cylinder to keep the swashplate at the proper angle.

7-140. When the Direction-Throttle Ball is released, the displacement control spool is returned to neutral by a spring. This allows oil from both servo cylinders to flow into the case through the small underlaps. Both servo cylinders are thus exhausted and one of the servo springs mechanically forces the swashplate to neutral.

7-141. HYDROSTATIC MOTOR ASSEMBLY (see figure 7-36).

7-142. The fixed displacement motor is an axial-piston motor that converts fluid power (received from the variable displacement pump) into rotary mechanical power.

7-143. The fixed displacement motor is attached to the unit final drive mechanism at the right-hand side of the drive drum (as viewed from the rear of the unit). The ports of the variable displacement pump are connected to the motor through high-pressure hoses.

7-144. FIXED DISPLACEMENT HYDROSTATIC MOTOR.

7-145. The fixed displacement hydrostatic motor output is coupled to a final drive by a shaft extending through the center of the drive drum.

7-146. The hydrostatic motor converts high-pressure hydraulic power into rotary mechanical power. The motor shaft can rotate in either

reverses the direction of the motor shaft.

7-147. The motor shaft and cylinder assembly rotate together. The direction of rotation depends on the direction of high-pressure oil entering the motor from the hydrostatic pump. High-pressure oil enters the motor main ports to push the cylinder pistons out of their cylinder and firmly against the motor swashplate. This action causes the piston slipper, which is protected by a film of oil to slide down the face of the swashplate, rotating the entire cylinder assembly. The cylinder block is splined to the motor output shaft. As the cylinder block rotates and the filled cylinders pass the other main port, return oil flows to the hydrostatic pump at low-pressure. The speed at which the cylinder block rotates is determined by the volume of pump output.

7-148. MANIFOLD.

7-149. The manifold is connected across both high-pressure and low-pressure sides of the main circuit. It includes:

- (1) two high-pressure relief valves
- (2) a shuttle valve
- (3) a low-charge-pressure relief valve.

7-150. HIGH-PRESSURE RELIEF VALVES.

7-151. Two high-pressure relief valves are located at each end of the manifold. They serve to protect the system against abnormal pressure surges in either of the branch lines of the main circuit. They accomplish this by dumping oil from the high-pressure line to the low-pressure line. Situations such as rapid acceleration, braking and sudden application of load can activate the relief valves.

7-152. SHUTTLE VALVE.

7-153. At other than neutral setting, the shuttle valve establishes a connection between the high-pressure line and the low-charge-pressure relief valve on whichever branch of the main circuit is at low-pressure. This connection provides control of charge pressure and a path for excess oil to escape to the cooling system. When the two branches of the main circuit are reversing their high-pressure and low-pressure functions, the spring-centered design

high pressure oil.

7-154. LOW-CHARGE-PRESSURE RELIEF VALVE.

7-155. The low-charge-pressure relief valve works with the shuttle valve to control pressure in the charge circuit and to remove excess oil to the cooling circuit. This valve will allow additional oil to dump if the high-pressure relief valves cannot dump fast enough under excessive conditions. Excess oil will be ported through the drain circuit to the oil cooler. It is operative only when the transmission is not in neutral.

7-156. PRESSURE CHECKS.

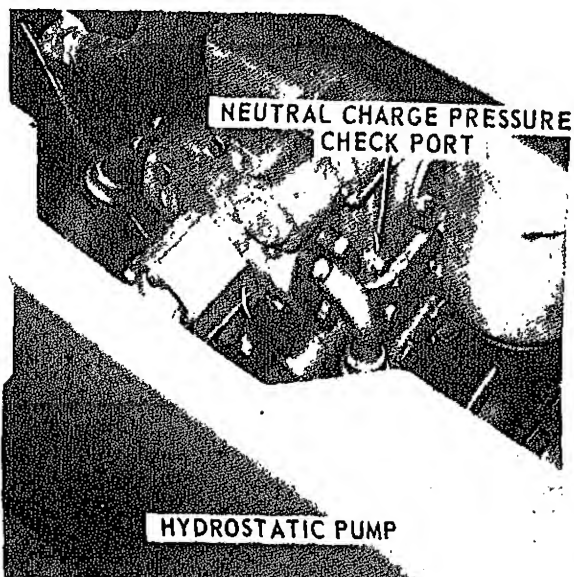
7-157. Pressure checks are imperative in troubleshooting the hydraulic system.

7-158. CHECKING NEUTRAL CHARGE PRESSURE (see figure 7-37).

7-159. Neutral charge pressure can be checked at the transmission pump as follows:

a. Remove the threaded plug from the charge pressure port. Install a 600 PSI (40 kg/cm²) gauge equipped with a short section of hose. Make sure the gauge is accurately calibrated.

NOTE: Use a 7/16 x 20 o-ring adapter in the port.



in neutral.

c. Start the engine and increase speed to 1500 RPM. The gauge should indicate 190 to 220 PSI (13.36 to 15.47 kg/cm²) above case pressure with oil at operating temperature. If the pressure is not within the specified limits, troubleshoot the system as specified in Table 5-2B.

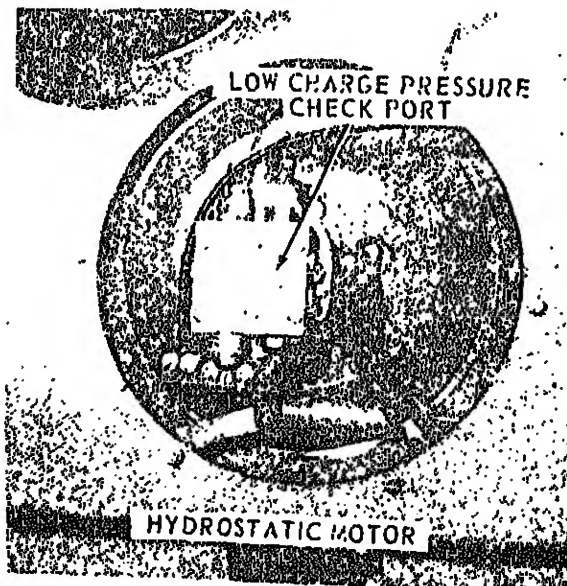
7-160. CHECKING LOW CHARGE PRESSURE (see figure 7-38).

7-161. The low charge pressure should be between 150 and 180 PSI (10.55 and 12.66 kg/cm²) above case pressure with oil at operating temperature, when the transmission is operating in forward or reverse. The low charge pressure relief valve is located in the motor manifold as shown in figure 7-38. Check the pressure as follows:

a. Remove the threaded plug from the Low Charge Pressure Check Port. Install a 600 PSI (40 kg/cm²) gauge equipped with a short section of hose. Use an o-ring adapter in the port. Make sure that the gauge is accurately calibrated.

b. Block the drive drum safely off the ground and start the engine.

c. Increase engine speed to 1500 RPM. Move the Direction-Throttle Control Ball slightly to



should indicate 150 to 180 PSI above case pressure (10.55 to 12.66 kg/cm²) in each direction.

d. If the pressure is not within the specified limits, replace the low charge pressure relief valve. If this fails to correct the pressure, troubleshoot the system as specified in Table 5-2B.

WARNING: Changing the quantity of shims in the relief valve is not recommended.

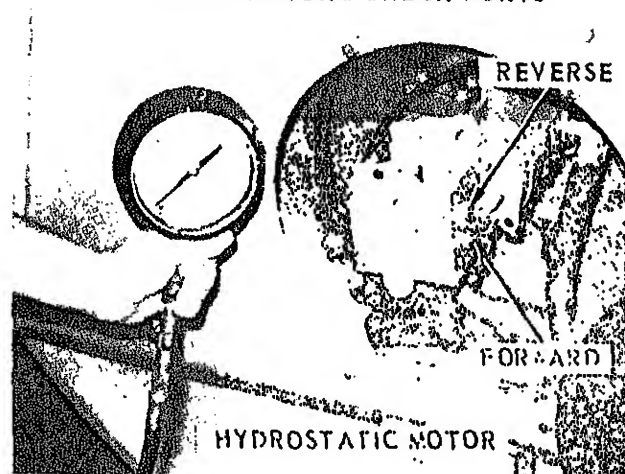
7-162. CHECKING HIGH PRESSURE RELIEF (see figure 7-39).

CAUTION: Transmission should **NOT** be stalled at high pressure relief for periods longer than 15 seconds.

7-163. The pressure in the high-pressure lines should be 5500 PSI (386.7 kg/cm²) when the transmission is in a stalled condition. Two (2) high-pressure relief valves are located in the motor manifold as shown in figure 7-39. Two (2) check ports are located at the side of the manifold for checking the setting of the relief valves. Check the high-pressure valves as follows:

WARNING: In order to check the high-pressure relief valves it is necessary to bring the unit to stall. **CAUTION** must be taken to ensure the safety of personnel when attempting to stall the unit

HIGH PRESSURE CHECK PORTS



restricted.

b. Remove the cover from the right-hand side of the frame at the drive drum.

c. Connect a 10,000 PSI (700 kg/cm²) gauge to the REVERSE check port (see figure 7-39).

d. Start the engine and set Park Brake. Increase engine speed to 1500 RPM.

e. Slowly move the Direction-Throttle Control Bail in the Reverse direction from neutral and bring the unit to stall. Observe the pressure gauge. With the transmission stalled, the gauge should indicate 5500 PSI (386.7 kg/cm²). If not, stop the engine and remove the two (2) high-pressure relief valves. It will be necessary to disconnect the two (2) high-pressure hoses.

f. Reverse the relief valves in the manifold ports and recheck at the REVERSE check port. If the pressure is normal, replace the relief valve originally removed from the reverse side of the manifold. If the pressure remains abnormal, troubleshoot the transmission as specified in Table 5-2B.

WARNING: Changing the quantity of shims in the relief valves is not recommended.

g. If pressure reading at Reverse port was normal then connect the gauge to the FORWARD check port (see figure 7-39).

h. Start the engine again and increase speed to 1500 RPM.

i. Slowly move the Direction-Throttle Control Bail in the Forward direction from neutral and bring the unit to stall. Observe the pressure gauge. With the transmission stalled, the gauge should indicate 5500 PSI (386.7 kg/cm²). If not, stop the engine and remove the two (2) high-pressure relief valves.

j. Reverse the relief valves in the manifold ports and recheck the pressure at the FORWARD port. If the pressure is normal, replace the relief valve originally removed from the forward side of the manifold. If the pressure remains abnormal, troubleshoot the system as specified in Table 5-2B.

k. Stop the engine and disconnect the

7-165. The control pressure can be checked at the transmission pump as follows:

a. Remove the threaded plugs from the two check ports and install a 600 PSI (40 kg/cm²) gauge equipped with a short hose in each port. Make sure that the gauges are accurately calibrated.

b. Place the Direction-Throttle Control Bail in neutral. Block the drive drum safely off the ground.

c. Start the engine and set speed at approximately 1500 RPM with the transmission in neutral. Shift the Direction-Throttle Control Ball to the forward position and observe the gauge. The pressure should be 45 PSI (3.2 kg/cm²) initially, then gradually reach charge pressure. Shift the Control Ball to the reverse position. The gauge should indicate 45 PSI (3.2 kg/cm²) initially, then gradually reach charge pressure.

d. If the pressures in both the forward and reverse directions is not as specified, the control valve assembly may be dirty or defective. If the pressure is abnormal in one direction only, the associated servo piston may be leaking.

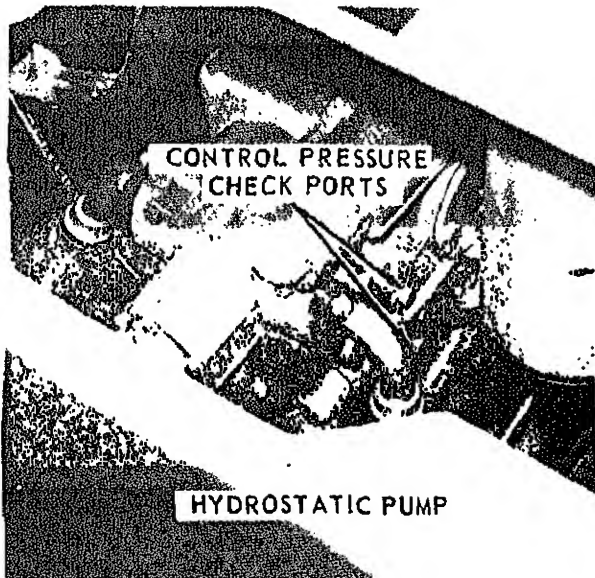


FIGURE 7-40.

7-32.

7-168. VACUUM CHECK

7-169. The suction filter is equipped with a vacuum gauge which indicates flow from the tank to the charge pump. The maximum vacuum at the charge pump inlet should not exceed ten inches (254 mm) of mercury at normal operating conditions. During cold start-up it is acceptable to have a higher reading. The unit should not be operated until hydraulic oil is at normal operating temperature and vacuum is below 10 inches (254 mm) of mercury.

7-170. ADJUSTMENTS.

7-171. DISPLACEMENT CONTROL VALVE NEUTRAL ADJUSTMENT (see figure 7-42).

WARNING: The drive drum **MUST** be safely blocked off the ground. Any movement of control valve spool causes the unit to shift out of neutral and the drum will turn. Caution personnel to stand clear of the drive drum.

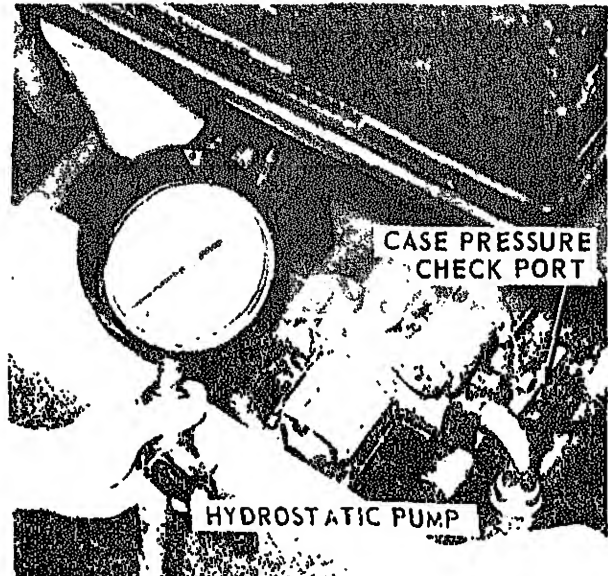


FIGURE 7-41.

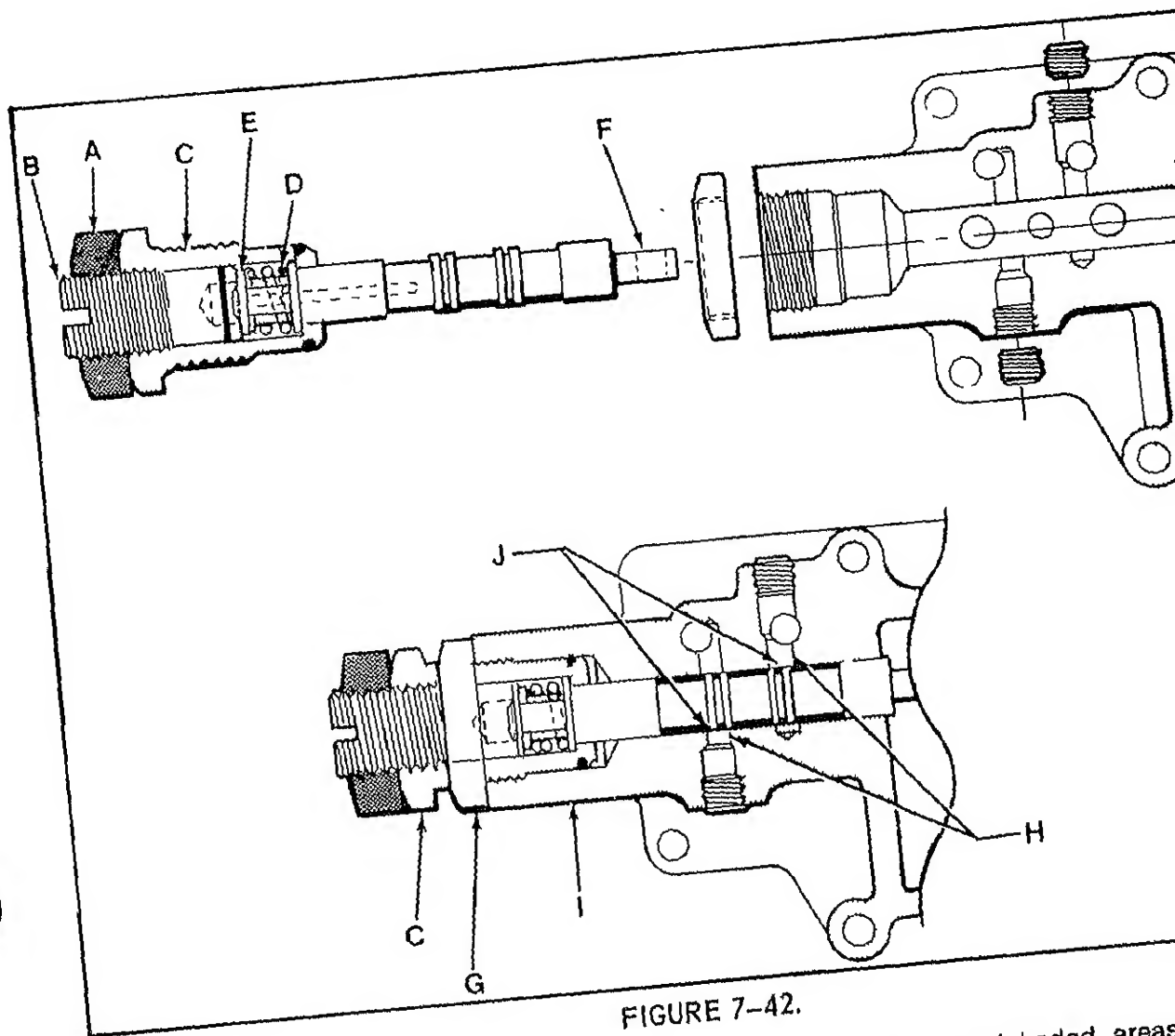


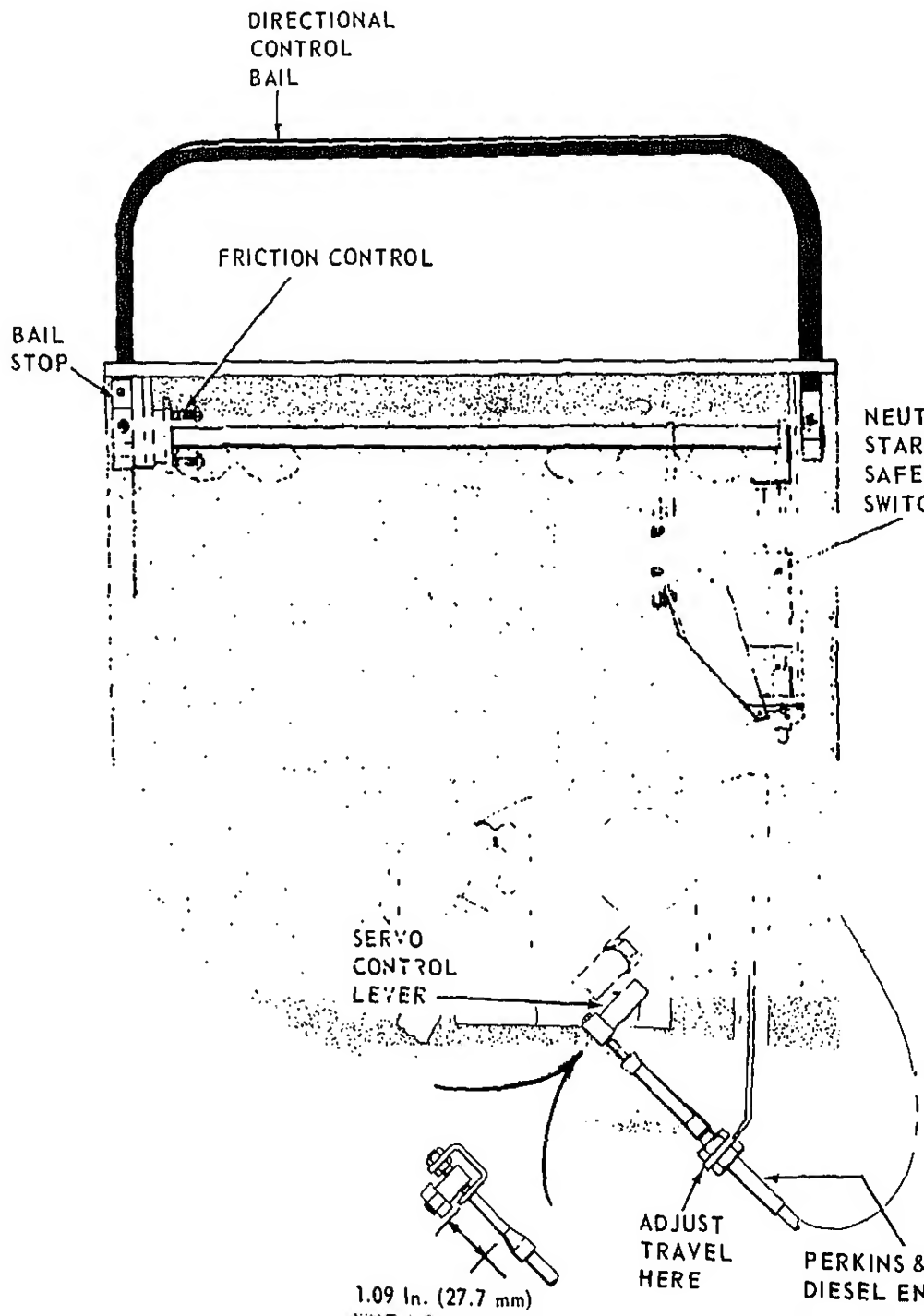
FIGURE 7-42.

a. Remove end play from centering spring mechanism with lockout (Ref. A) loose and holding the centering spring housing (Ref. C), turn the spring adjusting screw (Ref. B) until the screw is just touching the centering spring washer; thus taking the free end play out of the centering spring mechanism. This is best done by exerting a light back and forth force on the control valve spool (Ref. F) at the same time adjusting screw is being turned down. Care must be taken not to compress the centering spring (Ref. D) beyond its installed height. Tighten the locknuts (Ref. A) and recheck the spool (Ref. F) for end play.

that the open areas (shaded areas) between the spool lands and supporting holes are equal. Tighten locknuts (Ref. G), recheck the open areas and install two 7/16 x 20 plugs.

7-172. TRANSMISSION CONTROL VALVE ADJUSTMENT (see figure 7-172)

a. Place Direction-Throttle Control Valve in neutral (vertical) position. Adjust the valve at pump so that jam nut on end of valve is in full thread engagement and no end play. Tighten jam nut securely. Loosen jam nut on flywheel housing and adjust cable bracket on the servo pump control swivel on the bracket. Tighten



c. Move Direction-Throttle Control Ball in the forward direction until control cable at servo lever has traveled $11/16 - 31/32$ in. (24.64 - 26.92 mm). Adjust ball stops so that cable cannot be moved beyond this point.

d. Repeat step c in reverse direction.

CAUTION: Ensure that the amount of ball (control cable) travel is limited by ball stops and not the interval servo stops.

e. Return Direction-Throttle Control Ball to neutral (vertical) position.

g. Adjust ball joint in slotted crank on ball shaft to allow full throttle when ball is moved to either full forward or full reverse.

h. Adjust friction control nuts and spring assembly so that Direction-Throttle Control Ball will remain in any desired position.

7-173. THROTTLE CONTROL LINKAGE ADJUSTMENT PROCEDURE (see figure 7-44).

a. Adjust transmission control linkage per procedure outlined in paragraph 7-172 (Sundstrand).

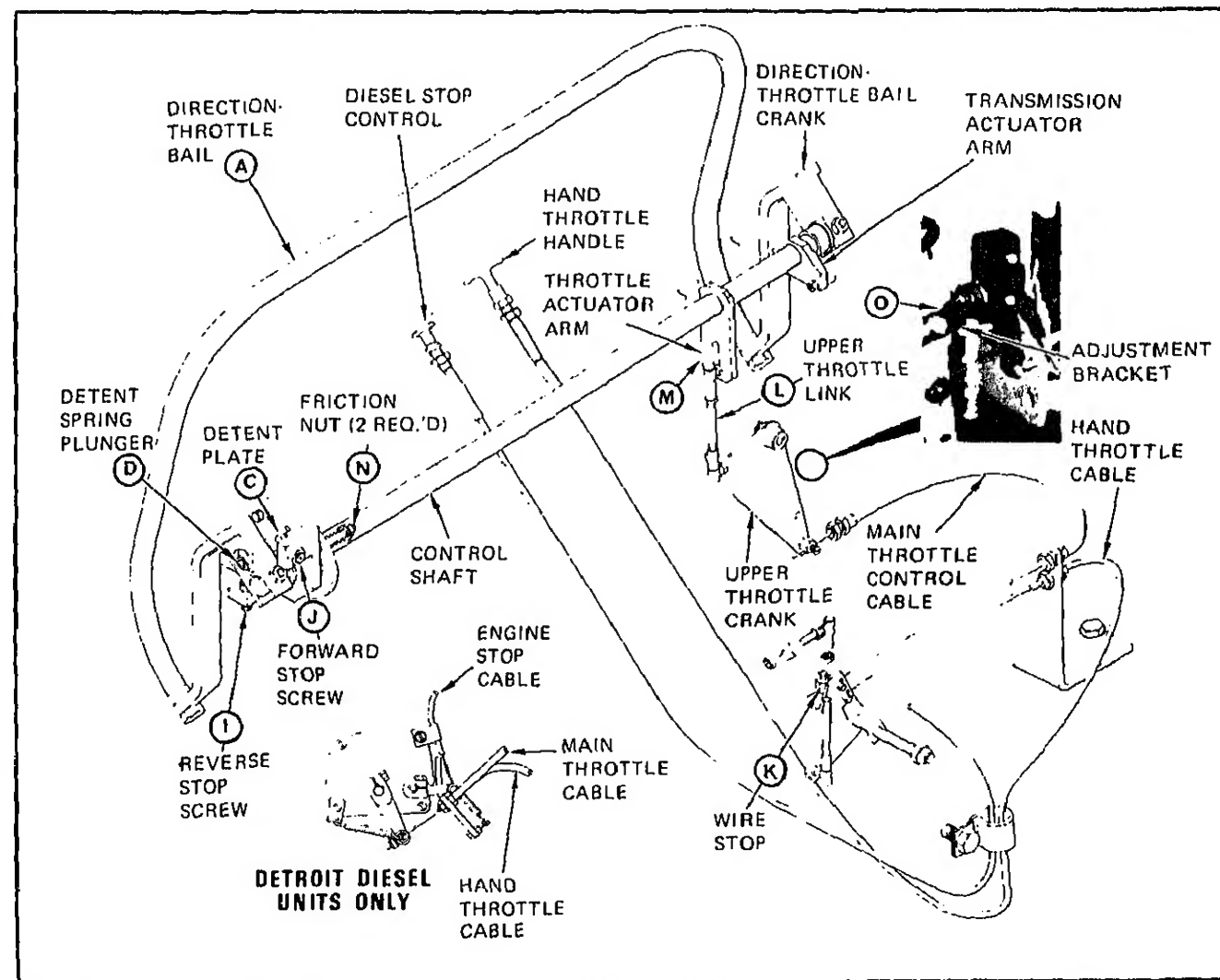


FIGURE 7-44.

c. Adjust wire stop (A) at lower throttle crank for 1/16 in. (1.59 mm) gap between swivel and wire stop.

d. Adjust position of upper throttle link (B) ball joint in slot of throttle actuator arm (C) so that full stroke of throttle is obtained when Direction-Throttle Ball is stroked from stop to stop. LENGTHEN upper throttle link (B) to reduce throttle stroke or SHORTEN link to increase throttle stroke.

NOTE: Throttle stroke should be identical in forward and reverse. Check for bent or binding linkage if a problem exists.

e. Adjust friction nuts (D) so Direction-Throttle Ball will stay in any position.

f. Adjust the neutral safety switch adjustment bracket (E) so that the switch will just barely be activated when the Direction-Throttle Ball is in neutral position.

7-174. TRANSMISSION REPAIR.

7-175. Should it become necessary to perform repairs to the Sundstrand transmission during the warranty period, certain parts, components or kits may be replaced without affecting or violating the warranty.

7-176. The following parts, components or kits may be replaced in the field as an assembly without affecting, violating or voiding the transmission warranty:

- a. Charge pump
- b. Check valves
- c. Motor manifold assembly
- d. High-pressure relief valves
- e. Displacement control valve (pump)
- f. Pump or motor shaft seals

7-177. The proper procedures for replacement of the above components are presented in the following paragraphs.

NOTE: Unauthorized repairs to transmission components other than those listed in paragraph 7-176 may void the warranty. Contact Hyster Company before attempting to perform repairs other than those presented in this manual.

CAUTION: When working on all hydraulic

transmission components, the immediate area to prevent from entering the transmission.

CAUTION: Whenever a component of a hydrostatic system has been moved, the transmission stop procedure MUST be performed before the unit can be started or operated or returned to service.

7-178. HYDROSTATIC PUMP REMOVAL (figure 7-45).

a. Remove the suction line at the filter plug or cap hose and fitting.

b. Disconnect control linkage from control lever.

c. Disconnect the hydraulic lines at the pump end housing. Plug or cap all of the pump.

d. Disconnect the high-pressure lines from the pump end housing. Plug or cap all and fittings.

WARNING: Use a hoist and sling arrangement to support the weight of the pump.

e. Remove the capscrews securing the pump mounting plate.

f. Pull pump straight back and tilt shaft of pump up enough to lift pump from unit.

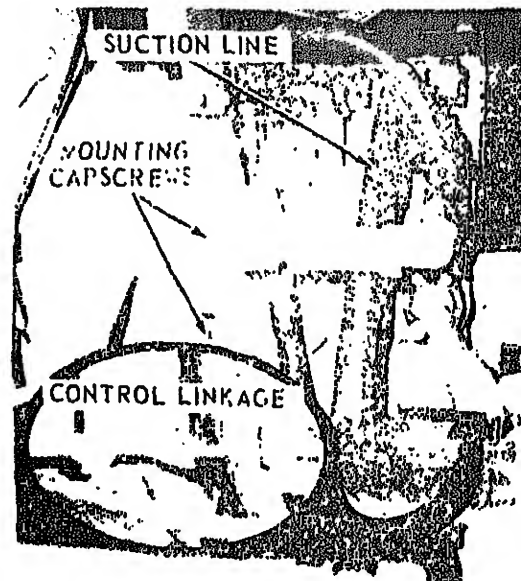


FIGURE 7-45

contamination.

7-179. REMOVAL OF HYDROSTATIC MOTOR (see figure 7-46).

- a. Remove hydrostatic motor inspection plate on the right-hand side of the frame.
- b. Disconnect high-pressure lines. Plug or cap ports on hoses. Remove the by-pass valve linkage.
- c. Support the hydrostatic motor and remove the four (4) motor mounting bolts.
- d. Carefully pull the motor far enough out of the motor carrier to remove the case drain line. Plug or cap all hoses and ports to prevent contamination of the hydrostatic system.

7-180. REPLACEMENT OF CHARGE PUMP.

7-181. REMOVAL (see figure 7-47).

- a. Remove the line connecting the charge pump to the reservoir and plug to prevent draining of the reservoir. Remove the connector fitting.
- b. Remove the four (4) capscrews.

NOTE: Do not remove the capscrews at the top and bottom of the charge pump (see figure 7-47).

pump. Use caution not to drop aluminum spacer.

CAUTION: Do not use sharp tools to pry charge pump from main pump. A scratch on the sealing surface may cause leakage. If charge pump does not pull loose, tap LIGHTLY on the side of the charge pump with a plastic hammer to break paint or gasket seal.

7-182. INSTALLATION (see figures 7-48 and 7-49).

- a. Install a new gasket. Make sure that the new gasket is properly installed as shown in figure 7-48. If positioned wrong, the relief valve port will be covered by the gasket.
- b. Line the drive tank on charge pump shaft with the slot on the main pump shaft (see figure 7-49). The charge pump should assemble freely with the main pump. Do not force charge pump into position. Hold aluminum spacer in position with fingers to prevent its dislodging.
- c. Torque the four (4) mounting bolts to 10-11 ft. -lbs. (1.38-1.52 kg-m).
- d. Install the connector to charge pump and torque to 14-20 ft.-lbs. (1.93-2.76 kg-m).
- e. Install the line from the reservoir to the connector on the charge pump.

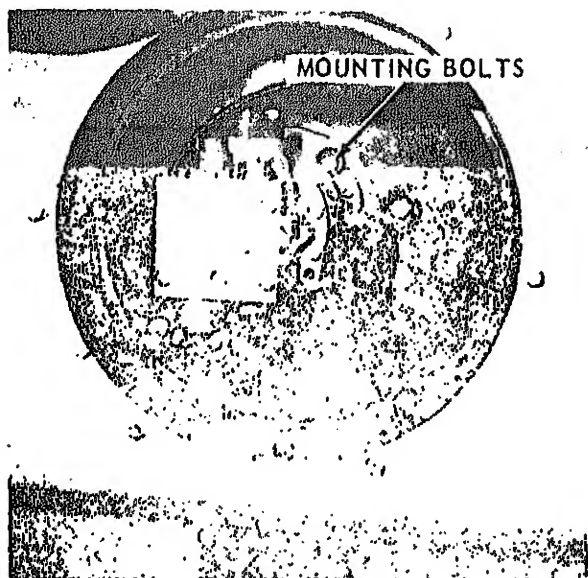




FIGURE 7-48.

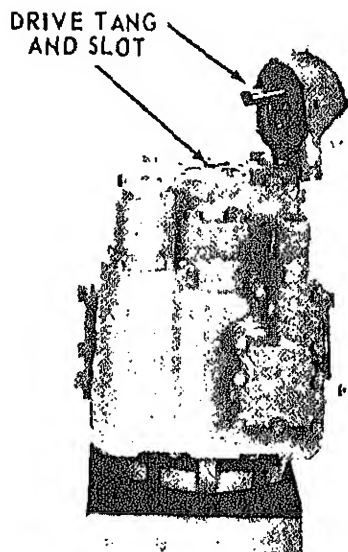


FIGURE 7-49.

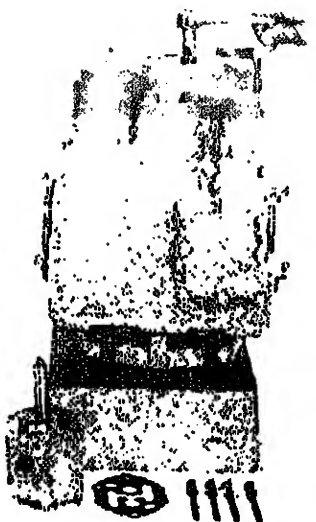


FIGURE 7-50.



FIGURE 7-51.

NOTE: Excessive tightening may distort the charge pump and cause leakage or malfunction.

f. Check oil level in the reservoir.

7-183. REPLACEMENT OF CHECK VALVES.

7-184. REMOVAL.

a. Remove the charge pump (see paragraph 7-181).

b. Using a drag link, unscrew check valve from end cap (see figures 7-50 and 7-51).

NOTE: There are two check valves. It is advisable to replace both check valves at the same time.

7-185. INSTALLATION.

a. Prior to installation, inspect o-rings for damage (see figure 7-52).

b. Apply a light coat of oil.

c. Install check valves and torque to 80-90 ft.-lbs. (11.06-12.44 kg-m).

d. Install charge pump (see paragraph 7-182).

CAUTION: The valves must assemble below the face of the end cap.

7-186. REPLACEMENT OF BY-PASS VALVE AND MOTOR MANIFOLD.

FIGURE 7-52.



FIGURE 7-53.

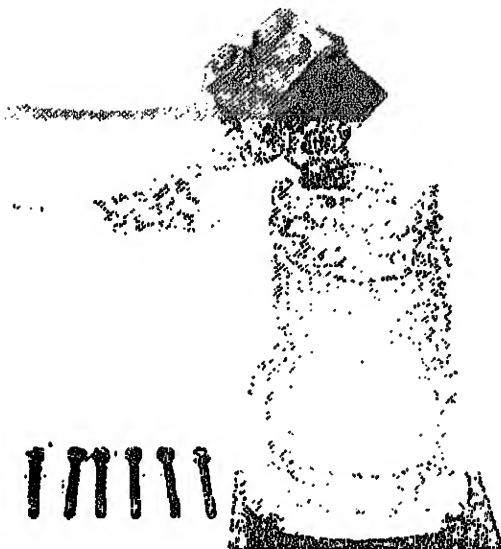


FIGURE 7-54.

b. Place drain pan under manifold to catch oil. Remove by-pass valve linkage.

c. Remove the four (4) corner bolts holding the manifold to motor end cap (see figure 7-53).

d. Grasp manifold to prevent it from dropping and remove the remaining two (2) mounting bolts (see figure 7-54). There is no gasket between the manifold and the end cap. Sealing is obtained by o-rings and back-up rings.

7-188. INSTALLATION.

a. Use new o-rings and back-up rings.

b. The two grooves side by side on manifold assembly (see figure 7-55) require an o-ring and a back-up ring (one of each per groove). The o-ring goes into the groove first. Then install the back-up ring on top of the o-ring. The flat side of the back-up ring faces away from the o-ring.

c. The groove positioned by itself (see figure 7-55) requires only an o-ring.

d. Place the manifold against the motor end cap. Install the bolts while making certain that

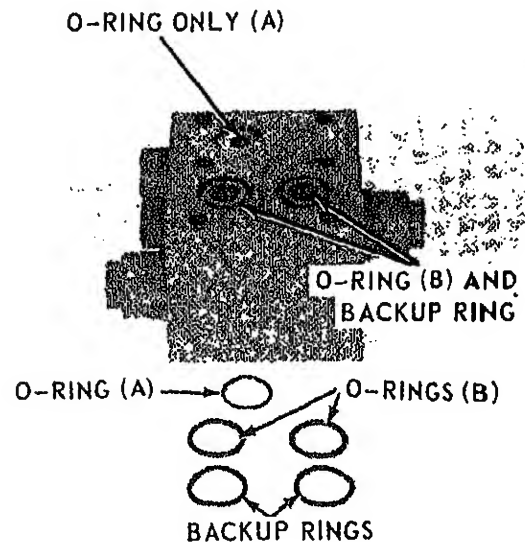


FIGURE 7-55.

7-190. REMOVAL.

a. Apply a wrench on HEX portion of the valve and unscrew from manifold block (see figures 7-56 and 7-57).

NOTE: There are two relief valves in the manifold block.

7-191. INSTALLATION.

a. Prior to installation, inspect o-rings and back-up rings for damage.

b. Apply a lubricant to the o-ring and install in the manifold block.

c. Torque valves to 20 ft.-lbs. (2.76 kg-m).

7-192. REPLACEMENT OF DISPLACEMENT CONTROL VALVE.

7-193. REMOVAL.

a. Remove the control linkage from the displacement control valve assembly.

b. Remove the nine (9) capscrews holding the valve to the pump housing (see figure 7-58).

c. Lift the valve away from the housing and remove the cotter pin and washer (see figure

APPLY WRENCH
TO HEX PORTION
OF VALVE

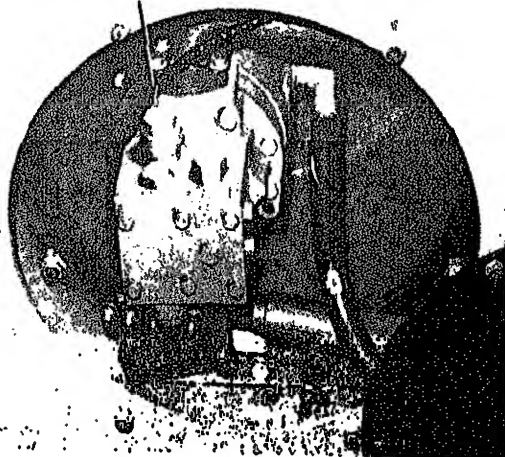


FIGURE 7-56.

opening will help to prevent accidentally dropping parts into housing.

d. Remove orifice and o-rings from control valve (see figure 7-60). Check to ensure orifice is open.

7-194. INSTALLATION.

a. Install orifice tip down, and new o-rings in control valve.

b. Install new gasket on control valve (see figure 7-61).

c. Install pin in control valve links and links.

d. Place washer in pin, install the cotter pin and spread.

NOTE: Caution must be taken during installation of these parts to prevent them from falling into the unit. Lubricating the parts with petroleum grease is advised.

e. Install valve to motor and torque the (9) bolts to 10-11 ft.-lbs. (1.38-1.52 kg-m).

7-195. REPLACEMENT OF MOTOR OR SHAFT SEAL.

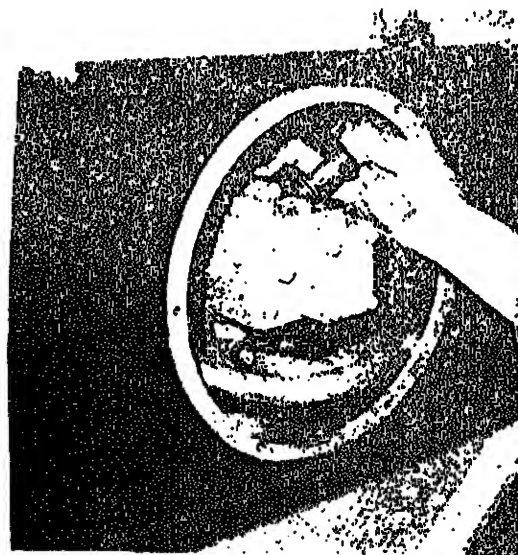


FIGURE 7-57.

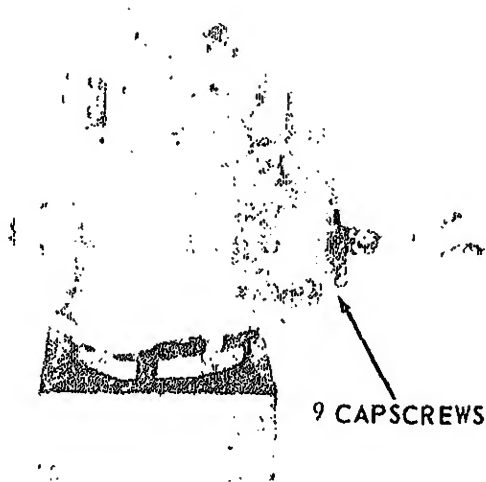


FIGURE 7-58.

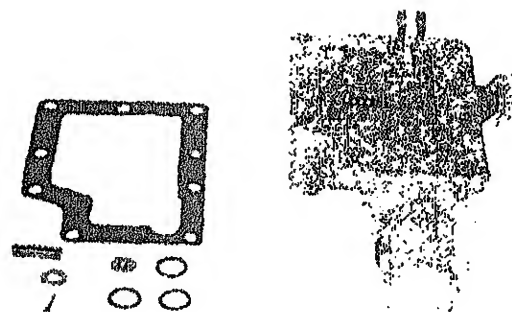


FIGURE 7-60.

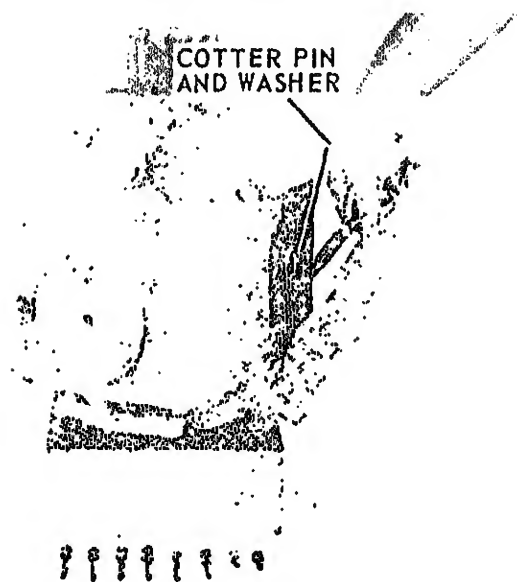


FIGURE 7-59.



FIGURE 7-61.

7-196. REMOVAL.

a. Disconnect hoses and remove pump or motor from unit.

b. Insert Tru-Arc #7 pliers in snap ring holes, compress the ring and roll it out (see figure 7-61).

c. Remove the aluminum seal retainer with a screwdriver (see figure 7-62).

(see figure 7-63).

e. With fingers or two screwdrivers remove bronze rotating part of the seal from drive shaft (see figure 7-64).

CAUTION: Use care not to damage bronze rotating ring or shaft splines.

f. See figure 7-63 and account for all the parts shown.



FIGURE 7-62.



FIGURE 7-63.

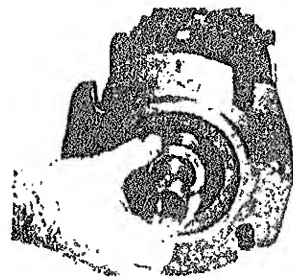


FIGURE 7-64.



FIGURE 7-65.

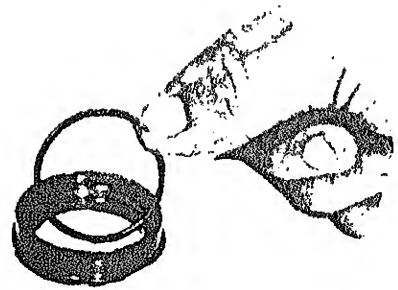


FIGURE 7-66.

CAUTION: Always replace both stationary and rotating parts of the seal. DO NOT mix old and new parts.

a. Wash and clean air dry new seal parts.

b. Install the seal springs into the aluminum seal retainer. Install the new o-rings (dry) on stationary steel part of seal into retainer so notch is located in pin in retainers (see figure 7-65).

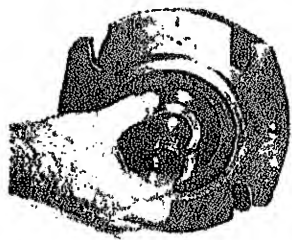




FIGURE 7-68.

TAPERED EDGE OUT

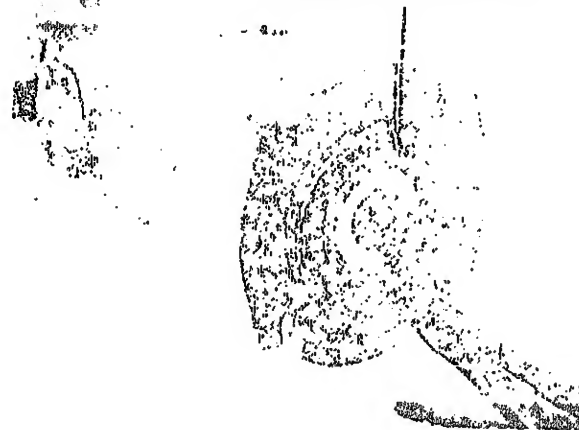


FIGURE 7-69.

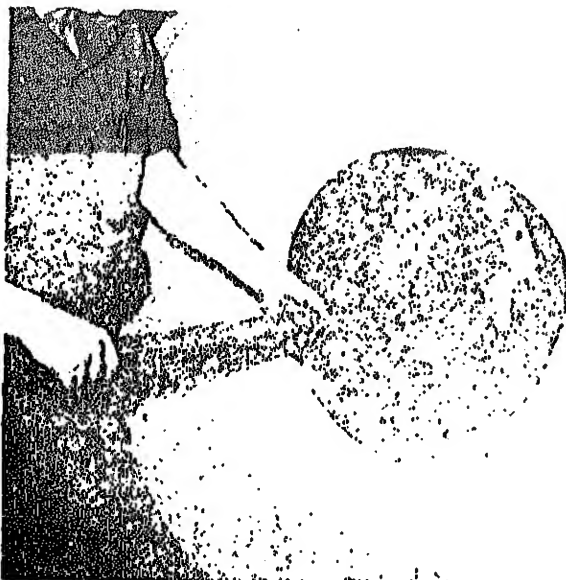


FIGURE 7-70.

shaft and slide the rotating bronze part over the shaft making sure it is sealed. Do not press on seal surface (see figure 7-67).

f. Install stationary seal and retainer into place and press the retainer in so the snap ring groove is open (see figure 7-68).

g. Close the snap ring with pliers. Install snap ring with tapered edge out.

h. For ease of installation, start snap ring in groove with the side opposite the snap ring holes (see figure 7-69).

7-198. REMOVAL OF DRIVE DRUM.

a. Complete the hydrostatic motor removal procedure presented in paragraph

7-179 (Sundstrand). Remove the drive shaft from the center of the drum (see figure 7-70).

b. Support the frame on both sides at the rear of the unit. Block the unit at the front and rear of the guide roll to prevent movement.

WARNING: The brake assembly will be removed prior to drum removal. Block the machine safely to prevent movement.

c. Complete brake assembly removal procedure presented in Section 10, paragraph 10.

d. Drain the final drive lubricant (refer to Section 4).

e. Remove the flange anchor capscrews. Before removing the hub capscrews, pull the anchor flange using the puller holes provided and appropriate capscrews. At the same time pry between the right side frame and drum moving the motor housing out of the side frame pilot (see figure 7-71).

f. Remove the hub (12 point) capscrews (C350B only) from the anchor flange and remove the flange from the drive drum. Then remove the brakeshaft outer snap ring (C350B only). Push brakeshaft in so that it will clear the frame for drum removal (see figure 7-72).

g. Carefully lift the drive drum from the unit. An alternate procedure is to remove the scraper beam at the rear of the unit and roll the drive

HOLES

FIG. 3
CAPSCREWS
(4 EACH)

FLANG
CLAMP
CAPSCREWS
(4 EACH)

FIGURE 7-71.

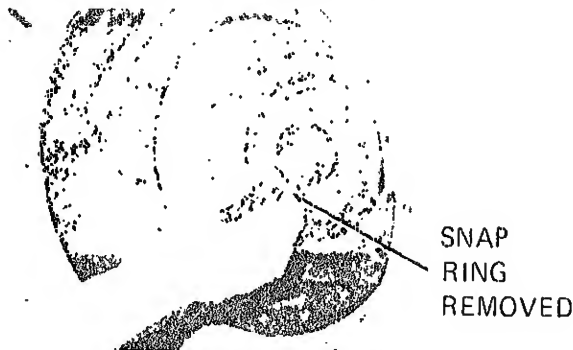


FIGURE 7-72.

drum out of the rear of the unit taking care not to damage machined surfaces (see figure 7-73).

CAUTION: Care must be taken not to damage machined surfaces.

WARNING: The drive drum is extremely heavy (approximately 12,000 lbs. (5,440 kg) without ballast.) Caution personnel in area to stand clear.

7-199. REMOVAL OF MOTOR CARRIER.

a. Complete the drive drum removal procedure presented in paragraph 7-198.

b. Remove the motor carrier-to-drum mounting capscrews by turning the carrier and aligning the hole in carrier with capscrews (see figure 7-74).

WARNING: Support the motor carrier with hoist and sling arrangement.

c. Using the puller holes provided, pull the

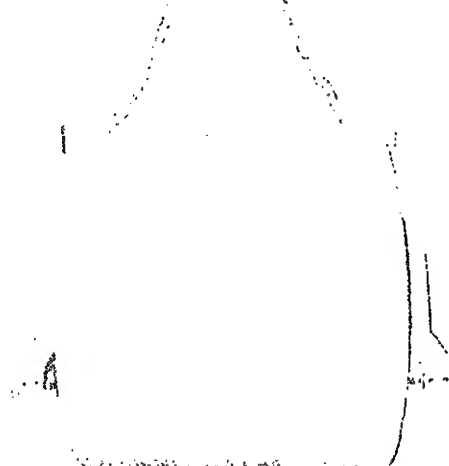


FIGURE 7-73.

7-200. DISASSEMBLY OF MOTOR CARRIER.

a. Remove o-ring on outside of bearing carrier for replacement. Remove bearing lock plate and shims. Check flatness of lock plate with a straight edge. Replace if deformed (see figure 7-75).

b. Lift off bearing carrier, upper bearing, and seal from motor housing. Tag the bearing cone with its respective cup (see figure 7-76).

c. Inspect the bearings, cups and cones. Remove bearing from the carrier and replace if the rollers or cups are worn, pitted or damaged in any way (see figure 7-77).



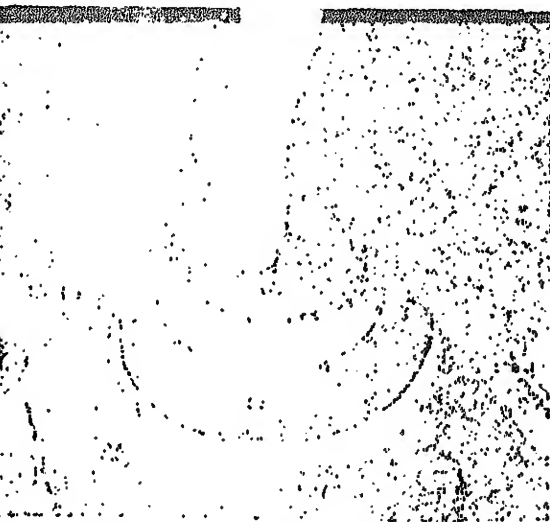


FIGURE 7-75.

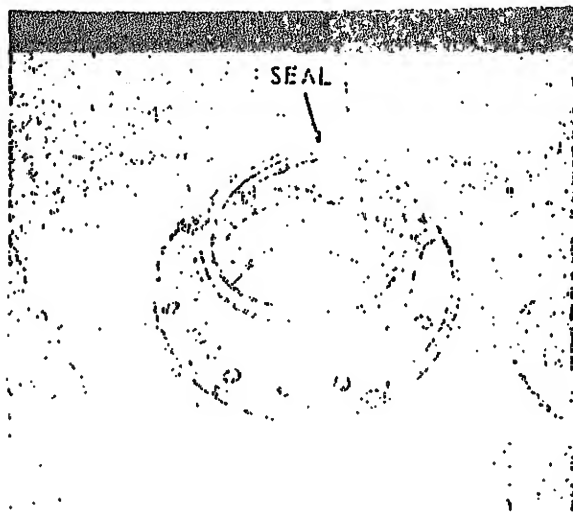


FIGURE 7-78.

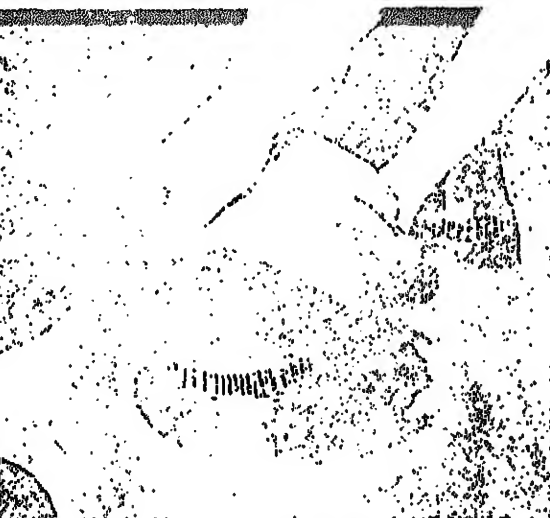


FIGURE 7-76.

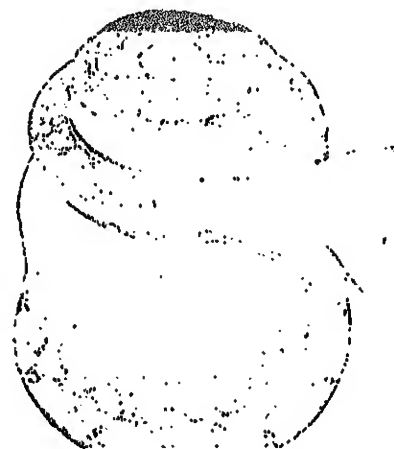
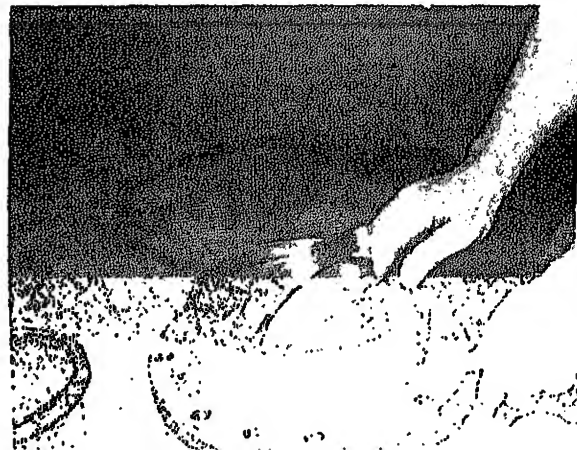
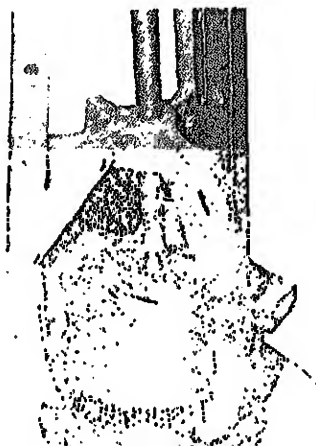


FIGURE 7-79.



CAUTION: The o-ring and oil seal in the motor side of the drive drum play a critical part in preventing premature failure of drum support bearing and the planetary system. These seals should be replaced during overhaul (see figure 7-78).

e. Replace o-ring if required by inspection in step c (see figure 7-79).

7-201. REASSEMBLY OF MOTOR CARRIER.

a. If new bearing cups are to be installed, press them firmly against the bearing carrier shoulders. Lubricate the bearings and cups with light machine oil or grease (see figure 7-80).



FIGURE 7-81.

b. Install a new oil seal with a press. Avoid use of drifts and hammers. They may easily damage component parts. Lubricate the oil seal lip (see figure 7-81).

c. Install bearing on housing by heating slightly if necessary. Seat the bearing cone firmly against the motor housing shoulder (see figure 7-82).

d. Set the bearing carrier with bearing cups and oil seal on the housing mounted bearing cone (see figure 7-83).

e. Place the bearing cone around motor housing hub and seat it into the bearing cup (see figure 7-84).



FIGURE 7-83.

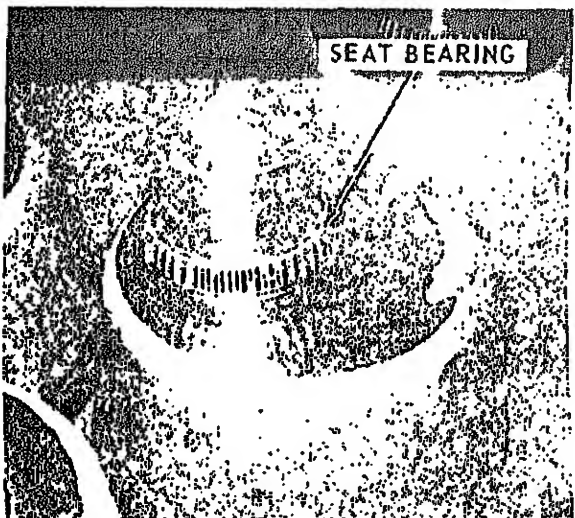


FIGURE 7-82.

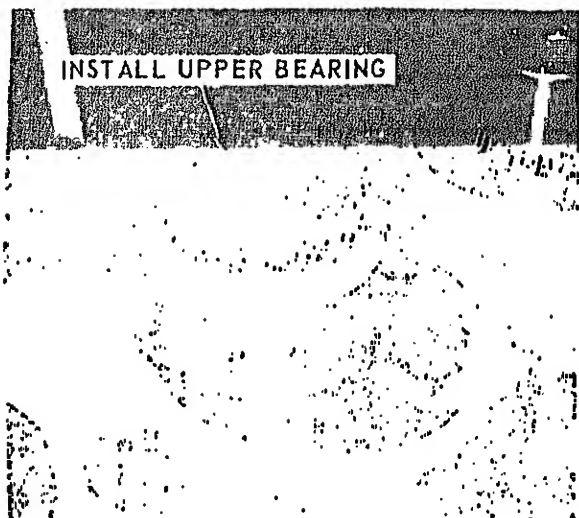


FIGURE 7-84.

housing hub to insure proper seating of the bearing and the oil seal lip.

f. Temporarily install the bearing retainer plate and torque the capscrews to 25 ft.-lbs. (3.457 kg-m). Rotate the bearing retainer on the motor housing hub to insure proper seating of the bearings (see figure 7-85).

g. Remove the bearing retainer plate and place a straight edge across the end of the motor housing hub and bearing cone. With a

motor housing hub and the straight edge (see figure 7-86).

h. Assemble a shimpack equaling measurement determined in step g plus .001 in. (.025 mm). Replace the bearing retainer plate and torque capscrews to 105 ft.-lbs. (14.521 kg-m) (see figure 7-87).

i. Install the o-ring (well lubricated) on the bearing carrier. Seat against the mounting flange (see figure 7-88).

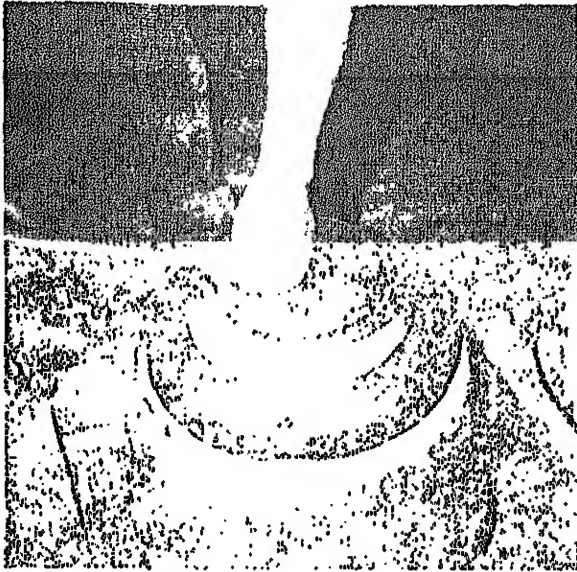
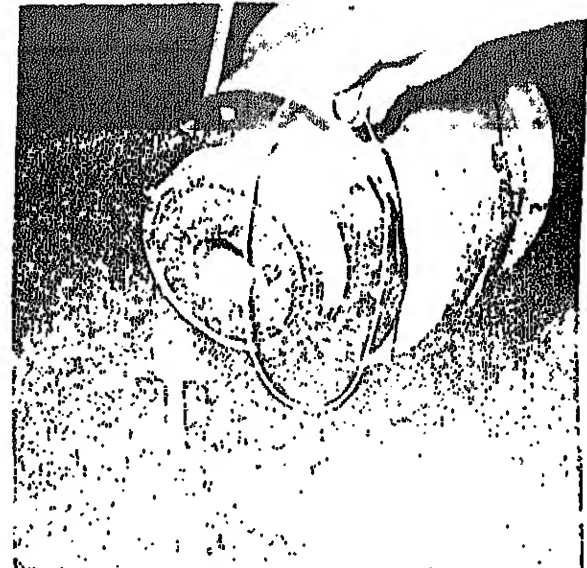
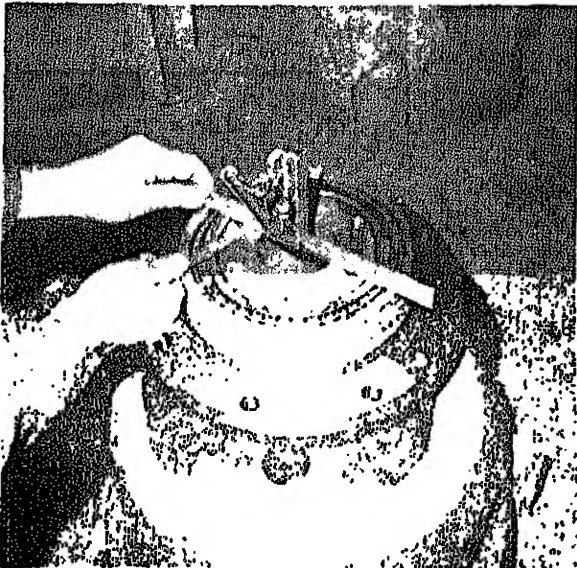


FIGURE 7-85.



FIGURE 7-87.



a. Lift motor housing with hoist and pilot the bearing carrier into the drum.

CAUTION: Care should be taken when installing the motor housing in the drum as not to damage the o-ring.

b. Align the capscrew mounting holes of the bearing carrier flange with those of the drum flange. This can be done through the access hole in the back surface of the motor housing. Coat capscrews with John Crane number 2 seal. Insert capscrews and torque per specifications (see figure 7-89). Torque C350B capscrews to 130 ft.-lbs. (17.98 kg-m).

c. Lift or roll the drum into the frame. The drum is aligned with the large holes in the frame (see figure 7-90).

b. Rotate the motor housing in the drum until the access hole in the back wall of the housing is at its highest extreme. Position motor housing pilot flange so it will fit into the frame (see figure 7-91).

c. Align the frame to motor housing capscrew holes and insert the capscrews. Tighten the capscrews in an alternate pattern back and forth across the motor housing. Turn these capscrews only 1/4 to 1/2 turn at a time until the motor housing is piloted into and bottomed against the frame (see figure 7-92).

7-203. INSTALLATION OF DRIVE DRUM.

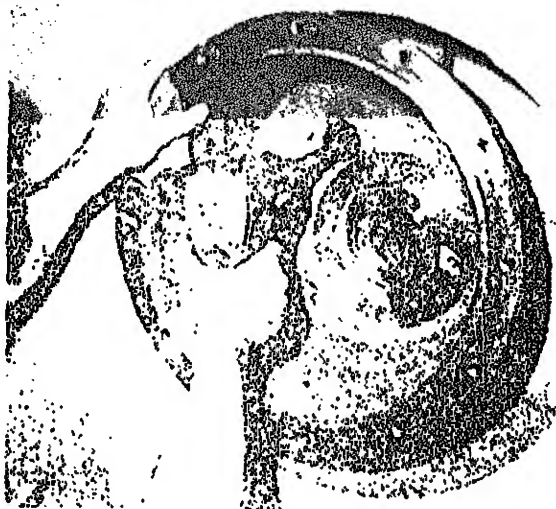


FIGURE 7-89.

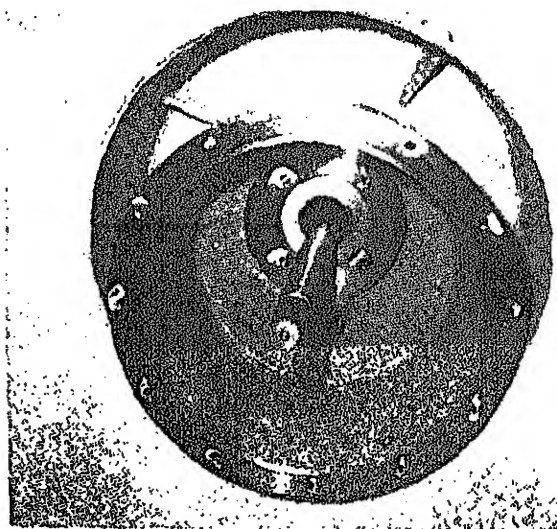


FIGURE 7-91.

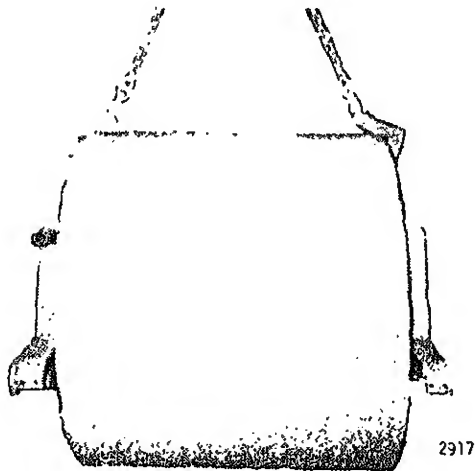


FIGURE 7-90.

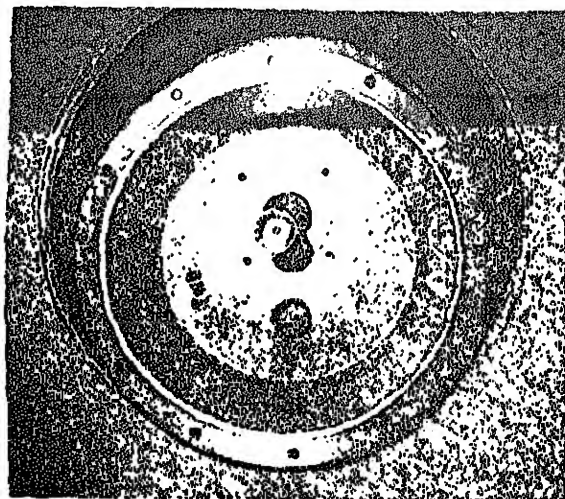


FIGURE 7-92

will turn hard as the drum is being pulled into position by these capscrews. Torque the capscrews per specification. Install the drive shaft.

d. Install snap ring on brake shaft (C350B only) (see figure 7-93).

e. Turn the drive shaft from the motor using end until the oil holes in the outer planetary hub are horizontal with the floor and above center (C350B only) (see figure 7-94).

f. Install scraper bar and bumper assembly if moved during disassembly.

planetary anchor flange on to the outer planetary hub (C350B only) (see figure 7-95). Install two capscrews in two remaining holes and torque to 120 ft.lbs. (C350B only) (16.6 kg-m).

NOTE: The alignment mark on the anchor flange should be aligned to the alignment mark on the planetary hub (C350B only).

h. Insert three equally spaced capscrews. Torque these capscrews to 15 ft.-lbs. (2.074 kg-m) and then remove them (see figure 7-96).

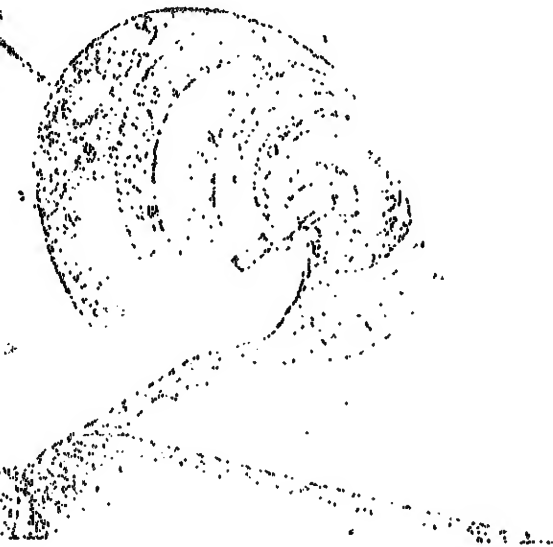


FIGURE 7-93.



FIGURE 7-95.

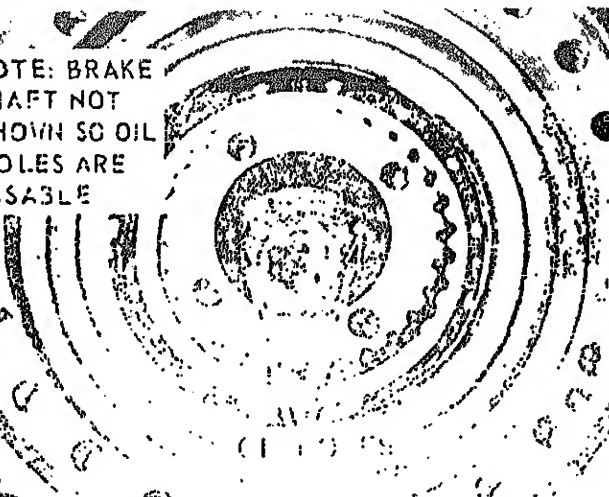


FIGURE 7-94.

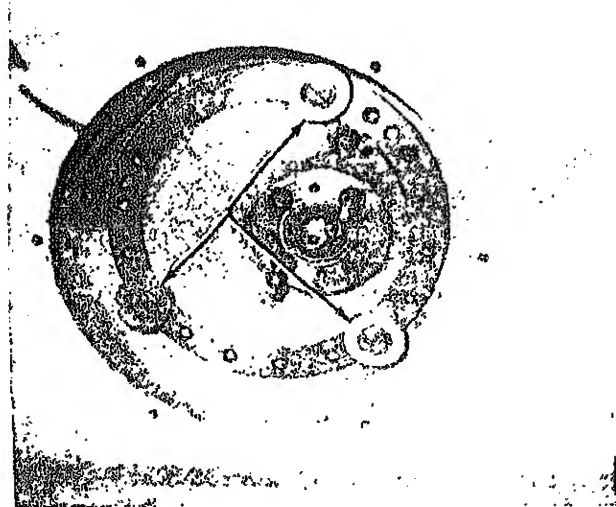


FIGURE 7-96.

and the planetary anchor flange. Take this measurement in three equally spaced locations. The best method of measurement is to use a depth micrometer and measure the depth from the outside of the flange through the puller bolt holes to the machined face of the frame. Total the three measurements taken and record them. Remove the anchor flange by using three puller capscrews (see figure 7-97). With a micrometer, measure the thickness of the flange next to the puller holes. Total the three measurements taken and subtract from the depth measurement. Divide your answer by three to obtain the shim thickness needed. For the C350B assemble a shim pack equal to the final answer plus .003 in. (.076 mm) or minus .002 in. (.051 mm).

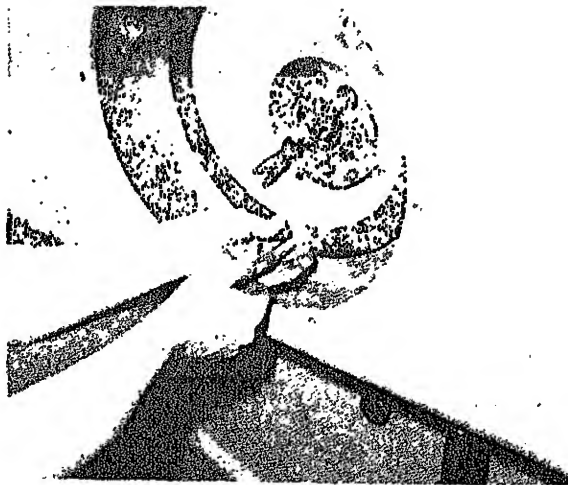
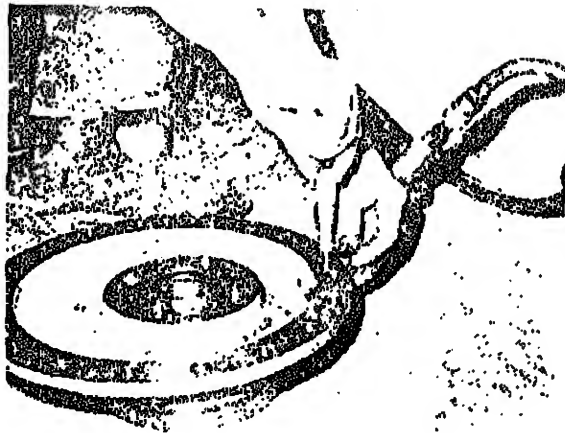


FIGURE 7-97.



possible using available shims) to the distance in step i. Be sure marks are as in step g (C350B only) (see figure 7-97).

CAUTION: The mating surface of the shims, and planetary anchor must be cleaned with solvent and dried with compressed air. Apply lubricant on these surfaces to cause the planetary anchor to work back and forth.

k. Install the four planetary-to-anchor cap screws and torque to 120 ft.-lb. (16.596 kg-m) (C350B only). Insert all frame-to-anchor flange cap screws and torque to 200 ft.-lbs. (27.660 kg-m) (see figure 7-99).

l. Pump the brake shaft support bearing

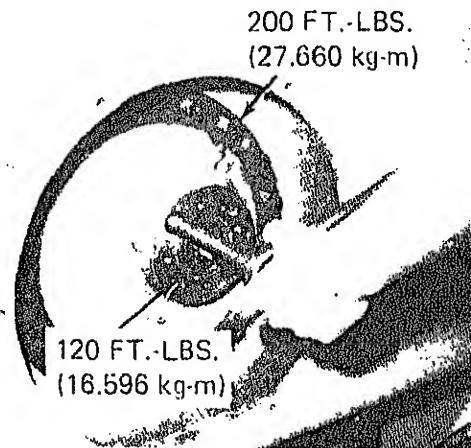
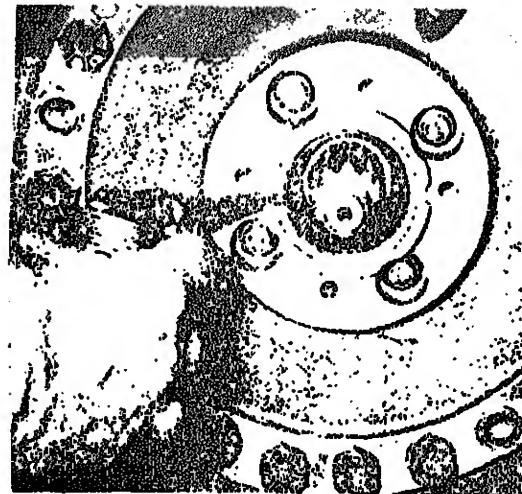


FIGURE 7-99.



refer to Section 1) (see Figure 7-100).

m. Fill final drive with lubricant (refer to Section 4).

n. Install the hydrostatic pump and motor.

o. Replenish transmission lubricant supply (refer to Section 4).

p. Follow transmission start-up procedure before returning unit to service.

7-204. INSTALLATION OF HYDROSTATIC MOTOR.

7-205. Install the hydrostatic motor by reversing the procedure presented in paragraph 7-179. Note the following:

a. The motor mounting surface should be coated with a plastic sealer.

b. Torque the motor mounting bolts to 75 ft.-lbs. (10.4 kg-m).

c. Torque the high-pressure lines to 35 ft.-lbs. (4.8 kg-m). Connect by-pass valve linkage.

d. After installation the transmission start-up procedure must be completed before returning the unit to service.

7-206. HYDROSTATIC PUMP INSTALLATION.

7-207. Install the hydrostatic pump by reversing the procedures presented in paragraph 7-178. Take note of the following:

a. Torque pump mounting capscrews to 75 ft.-lbs. (10.4 kg-m).

b. Torque high-pressure line capscrews to 35 ft.-lbs. (4.8 kg-m).

CAUTION: Follow transmission start-up procedure before returning unit to service.

7-208. CLEANING THE HYDRAULIC SYSTEM.

CAUTION: The importance of cleaning the entire hydraulic system after any component failure cannot be over-emphasized. If a failure occurs in either the hydrostatic drive system or the steering circuit, the entire

assembly must be disassembled and cleaned.

7-209. Removal and disassembly of the following list of components is required when any system component fails. Inspect each component for damage and rebuild or replace as required.

a. Steering pump.

b. Steering cylinder.

c. Steering control unit.

NOTE: Matching of mating parts is critical.

d. Cooler by-pass valve.

e. Hydraulic tank.

f. Transmission displacement control valve.

g. Transmission servo cylinders.

h. All hoses.

NOTE: Replace the oil filter with a Hyster approved 10 micron filter only. It is recommended after overhaul that the oil filter be replaced at 50 hours after start-up before returning to normal maintenance cycle.

7-210. Refill the hydraulic system with oil per specifications (see Section 2).

7-211. Precharge the hydraulic system as follows:

a. Disconnect the case drain hose at the pump.

b. Fill pump and motor cases with specified oil (see Section 2).

c. Loosen the end of the suction hose at the charge pump. If hydraulic oil is not present, pressurize the tank to a maximum of 10 PS (0.7 kg/cm²).

d. Retighten hose fittings when oil appears.

e. Complete the transmission start-up procedure.

NOTE: Partial cleaning of the system is ineffective. Any contamination left in the system may cause a repeat failure.

**7-212. SUNDSTRAND TRANSMISSION
START-UP PROCEDURE.**

a. Block the drive drum safely off the ground.

b. After the transmission has been installed, remove the threaded plug from the top of the main pump housing (see figure 7-101). Install a 600 PSI (42.19 kg/cm²) pressure gauge with a short section of hose. The port is 7/16 x 20 straight thread with o-ring. Low charge pressure may be checked at the motor case port as shown in figure 7-102.

c. Check all fittings to be sure that they are tight.

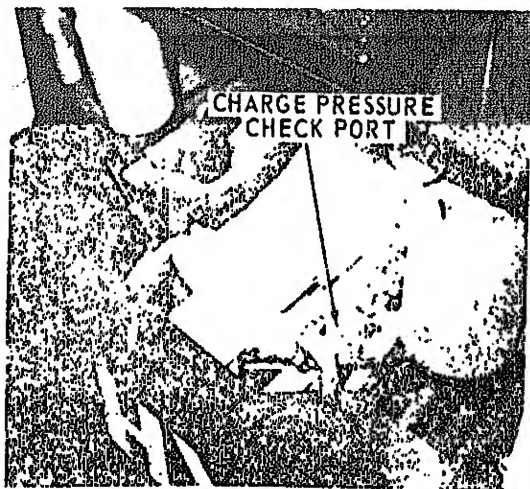


FIGURE 7-101.

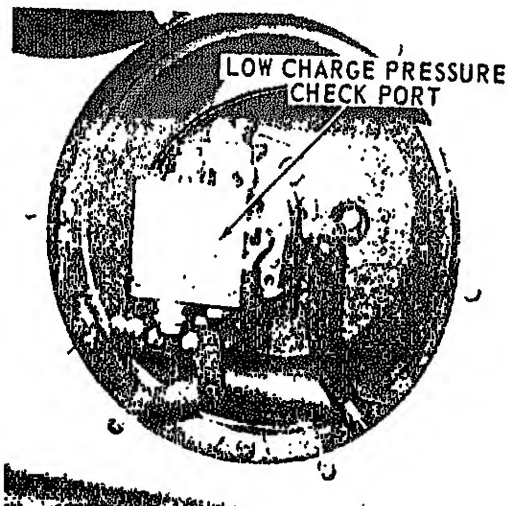


FIGURE 7-102.

oil (see Section 2). All fluid should be passed through a 10 micron filter. Reinstall and tighten case drain line.

e. Loosen the charge pump line, coming from the filter/reservoir (see figure 7-103).

f. Fill the reservoir and hoses with specified oil (see Section 2). Install and tighten the hoses (see figure 7-103).

WARNING: Disconnect the push-pull cable from the pump until after initial start-up. This will allow the pump to remain in neutral (see figure 7-104).

g. Pull out the engine coil wire or close the



FIGURE 7-103.

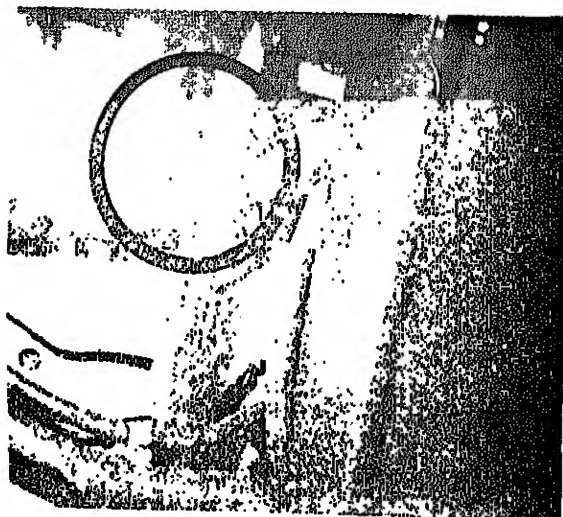


FIGURE 7-104.

Injector rack and turn the engine over until charge pressure reaches 30 PSI (2.1 kg/cm²) or more.

h. Start the engine and maintain a 750 RPM speed for five (5) minutes. This will allow the system to fill properly. Pressure surges may be observed on pressure gauge - this is normal while running at 750 RPM, the charge pressure must be at least 100 PSI (7.0 kg/cm²) above case pressure. If it is not, shut down and troubleshoot (see Section 5).

i. Increase speed to 1000 RPM; charge pressure should be 190-220 PSI (13.4-15.5 kg/cm²) above pump case pressure.

j. Shut down the engine and reconnect the push-pull cable to the pump linkage.

k. Check oil level in reservoir. Fill if necessary.

l. Restart engine and run at 1500 to 1800 RPM. Charge pressure should be 190-220 PSI (13.4-15.5 kg/cm²) above pump case pressure.

m. Move Direction-Throttle Control Ball slowly to the forward and then to the reverse position. Charge pressure will drop to 160-180 PSI (11.2-12.7 kg/cm²) above pump case

pressure. Repeat cycle for five minutes.

CAUTION: Should the charge pressure drop below 100 PSI (7.0 kg/cm²) above pump case pressure at any time, discontinue start-up until trouble has been determined.

n. Run engine at maximum RPM with pump in neutral. Observe the reading of suction filter vacuum gauge located on filter. This gauge should be reading NORMAL.

o. Shut down engine, remove all gauges and replace all lines and plugs. Check reservoir level and tighten oil fill cap.

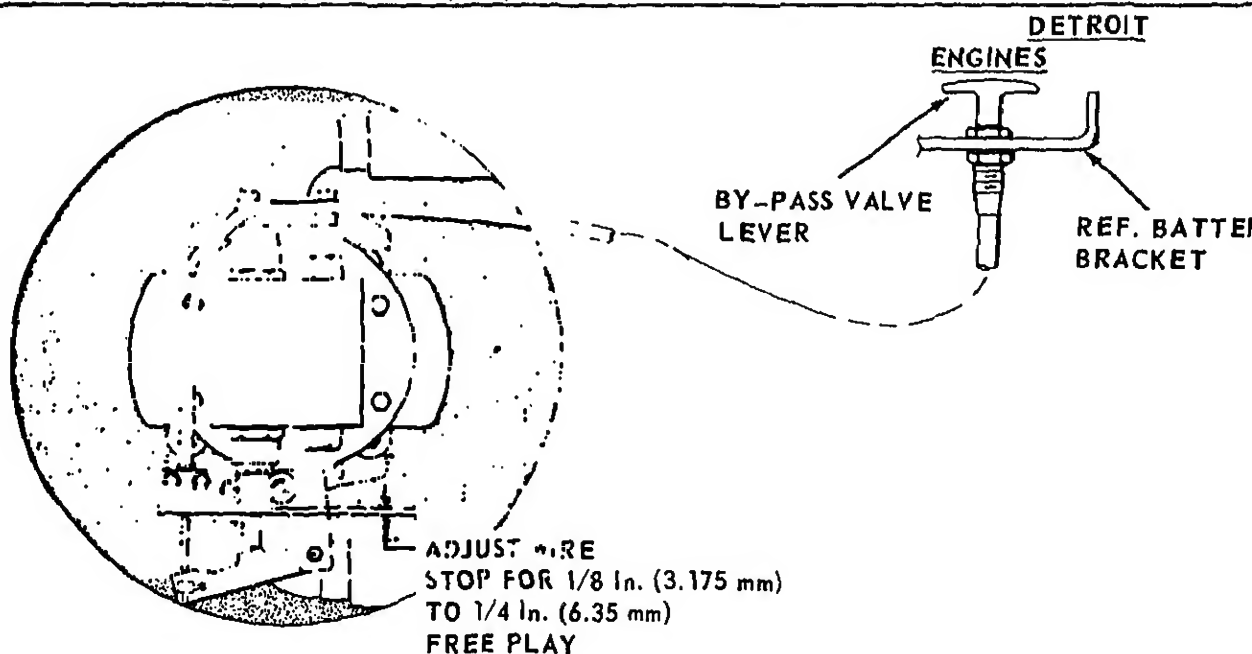
p. Machine is now ready for operation.

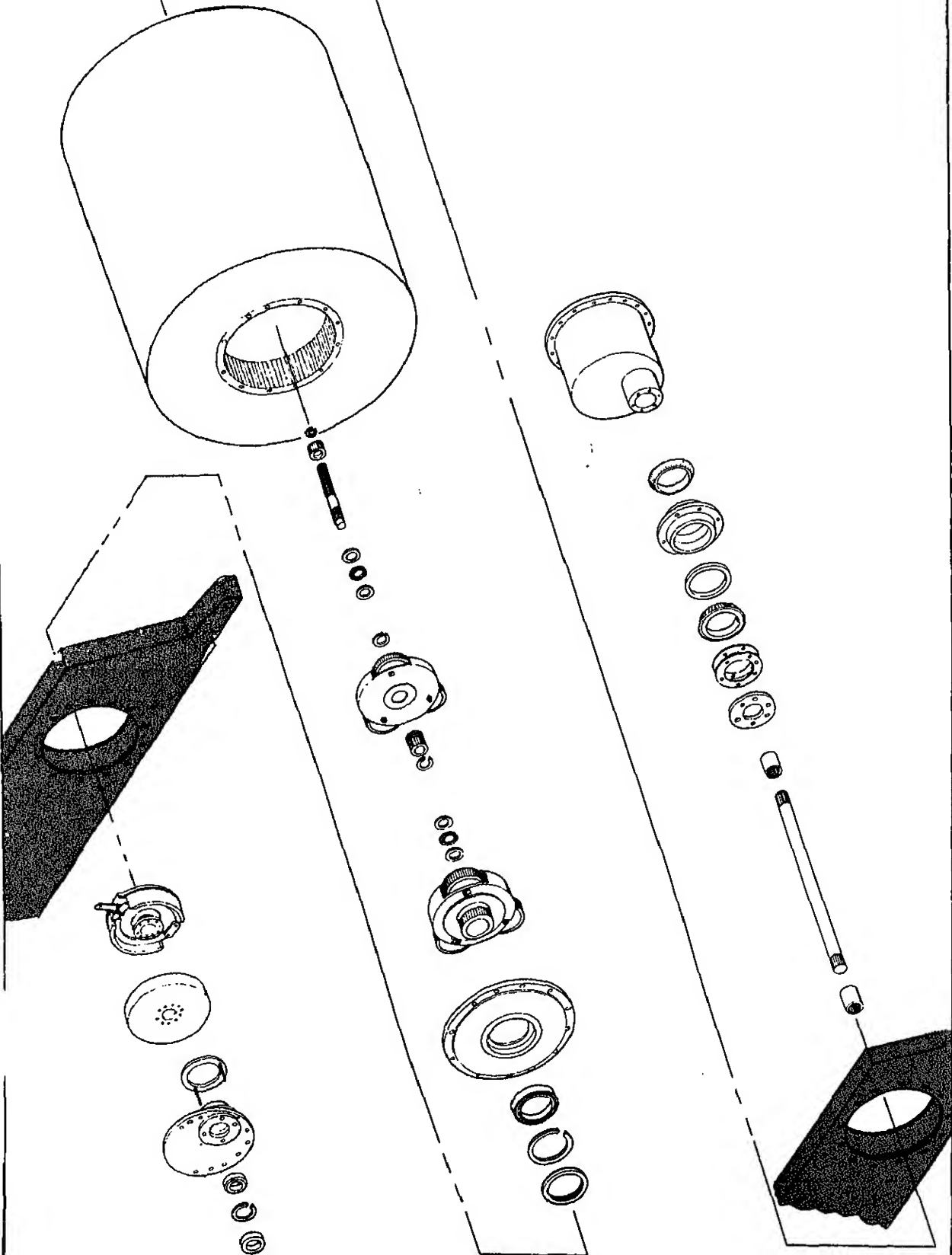
7-213. BY-PASS VALVE.

7-214. Refer to Section 3, paragraph 3-29 for complete explanation of the by-pass valve and its function.

7-215. BY-PASS CONTROL ADJUSTMENT.

a. Adjust wire stop on control cable for 1 1/4 in. (3.2-6.4 mm) free play (see fig. 7-105).

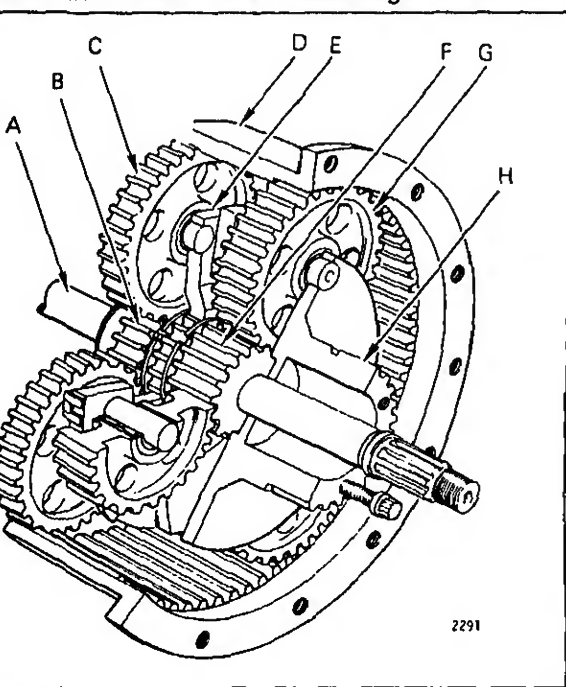




This section contains a description of the drive operation and overhaul instructions components of the drive drum assembly. Overhaul instructions include removal, disassembly, inspection, reassembly and installation of all components of the final drive assembly. Design specifications are given in Section 2. Troubleshooting instructions are given in Section 5.

C350B FINAL DRIVE DESCRIPTION (see figure 8-2).

The final drive consists of an internal, double reduction planetary system located in the left side of the single drive drum (see figure 8-1). Torque is transferred from the hydraulic motor (across the drum) to the planetary system by the drive shaft (A). A sun gear (B) is splined to this shaft and drives the carrier of the two planetary gear sets (C) in opposite direction. This gear set (C), in an attempt to turn the ring gear (D) (bolted directly to the drive drum) in the same direction gear set (C) is traveling, but does not possess the mechanical advantage to do so.



(non-stationary) walks around the ring gear (D). Planet carrier (E) is splined to and drives a second sun gear (F) which rotates in the same direction as, but independently of, sun gear (B). Sun gear (F) then drives the larger planetary gear set (G) which is capable of turning the ring gear (D) and the drive drum. (Ring gear (D) is attached to the drum.) The second larger planet carrier (H) is bolted to the frame, and provides the reaction necessary to drive the drum.

8-6. REMOVAL AND DISASSEMBLY OF FINAL DRIVE ASSEMBLY.

- a. Drain the lubricant (refer to Section 4).

NOTE: Inspect the lubricant for foreign particles. Keep samples for failure analysis.

- b. Block the guide rolls front and rear.

WARNING: Do not depend on the parking brake to prevent the unit from moving. The brake assembly will be removed prior to the removal of the drive drum.

- c. Jack up both sides of the frame so that the weight of the frame is on the jacks and not the drive drum.

- d. Remove the scraper bar and bumper assembly mounting capscrews and lift off the assembly.

- e. Complete the DRIVE DRUM removal procedure presented in Section 7, paragraph 7-198.

- f. Remove the capscrews in the drum hub. Pull the hub using the puller holes provided and appropriate puller bolts. Install two dowel (guide) pins (see figure 8-3).

WARNING: Connect the drum hub to a hoist prior to complete removal from the drive drum. The outer planetary assembly will accompany the drum hub upon removal. Care should be taken when handling these components.

- g. Remove the inner planetary assembly (see figure 8-4).

- h. Remove the brake shaft snap ring. Then

figure 8-3).

i. Inspect ring gear for wear, damage, cracked teeth or any other signs of impending failure. Use the puller holes provided to remove ring gear if replacement or repair is necessary (see figure 8-6).

j. Seal off drive shaft hole and steam clean planetary gear case in the drive drum. make sure pockets and corners are cleaned thoroughly.

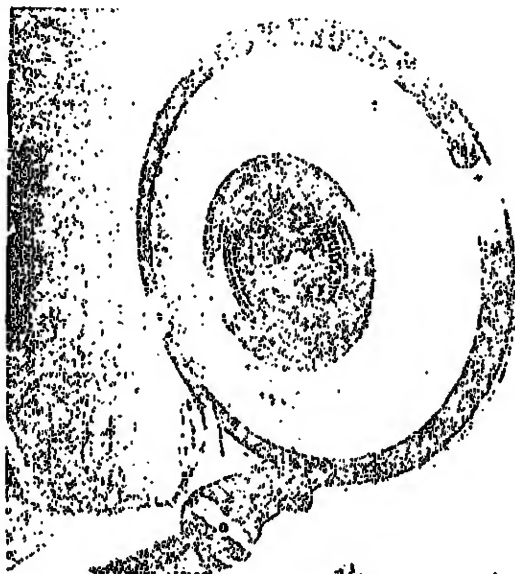


FIGURE 8-3.



FIGURE 8-4.

protector and bearing it to work on (see figure 8-7).

l. Inspect the interlocked sun excessive wear on both of its thrust (one located at each end) and two cracked splines or any other signs of impending failure. Remove if necessary by removing snap ring from inside of the sun and lift out the gear (see figure 8-8).



FIGURE 8-5.

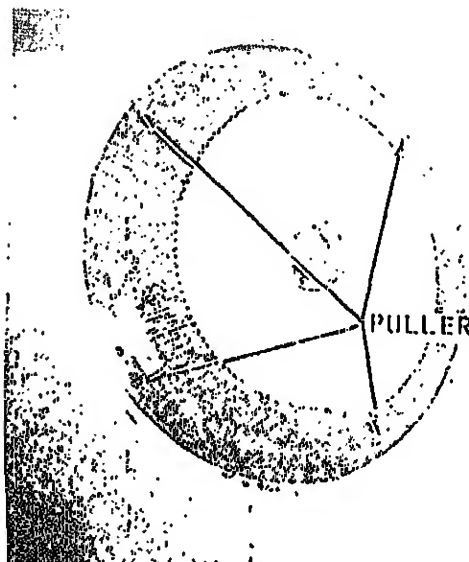


FIGURE 8-6.

the drive drum hub using an arbor press (figure 8-9).

CAUTION: The drum hub must be supported at three equally spaced points while pressing out the outer plane of the assembly to prevent damage to the drum hub.

n. Disassembly of drive drum hub. Remove the oil seal for replacement. Check the companion flange seal surface is smooth (figure 8-10).



FIGURE 8-7.



FIGURE 8-8.

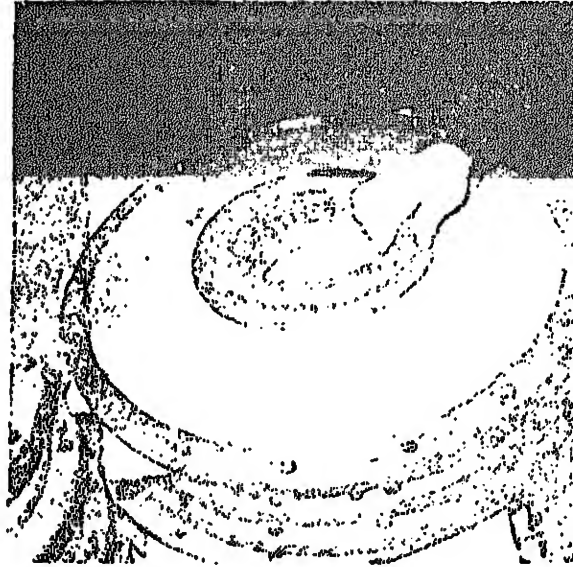
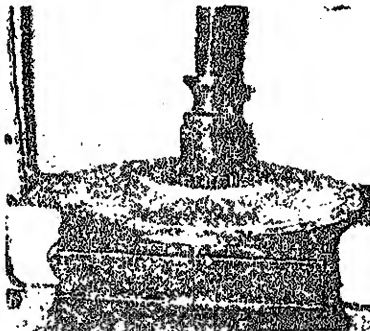
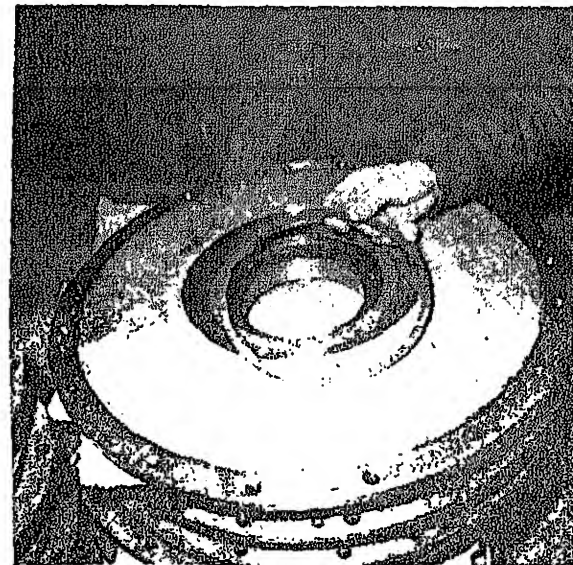


FIGURE 8-10.



o. Pry out the snap ring with a large screwdriver or medium size pry bar. Replace if worn or scored (see figure 8-11).

p. Turn the drum hub over and place it in an arbor press. Using an appropriate size pusher, press out the large bearing (see figure 8-12).

q. Place the inner planetary assembly on a protected surface with the interlocked sun gear down.

r. Clean the webbed portion of each of the three planetary pinion gear and mark their position with respect to the planetary carrier (see figure 8-13).

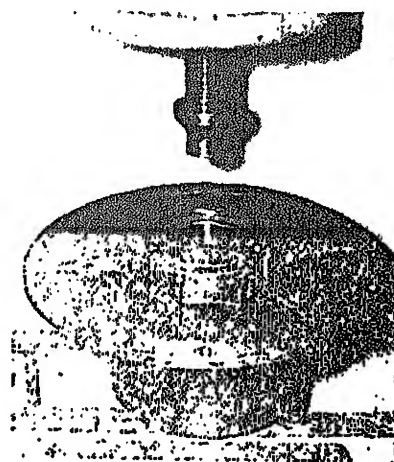


FIGURE 8-12.



NOTE: Since the planetary pinions are extremely hard, a punch is not effective. To mark these planetary pinions, a small portion of each gear with light color paint and etch either 1, 2, or 3 on each gear.

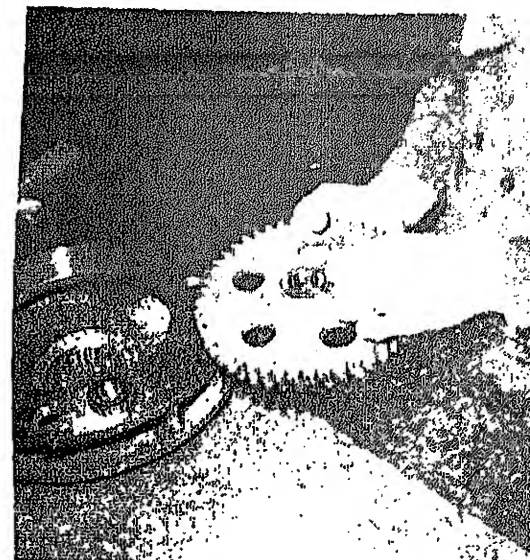
NOTE: The planetary carrier can be marked correspondingly with a punch.

s. With the planetary pinion gears properly marked, unlock and remove the pinion gear cap screw, lockplate and spacer (see figure 8-14).

t. Push the pinion gear riding pin out of



FIGURE 8-14.



thrust washers, and bearings (see figure 8-15).

CAUTION: The bearing cones will fall out of the pinion gear as soon as they are free to do so. Keep each cone with its respective cup by tying them in position in the pinion gears. Remove the other two, pinion gears from the carrier using the same procedure. Keep each gear and its associated parts separate. Do not mix component parts.

u. Inspect each bearing cup and cone, including those not removed from the pinion gears, and replace if rollers or cups are worn, pitted or damaged in any way. Remove parts needing replacement (see figure 8-16).

v. Remove bearing cups from planetary pinion with a small soft punch and hammer.

NOTE: A snap ring separates and locates the two cups in each pinion gear. Remove the lower cup only, i.e., the pinion must be turned over once to remove both cups (see figure 8-17).

w. Remove the snap ring with a screwdriver or a small pry bar and inspect for chipping or wear. Replace if necessary (see figure 8-18).

x. Place the outer planetary assembly on a protective surface with the large splined hub upward. Follow steps q through w of the in-

8-7. CLEANING AND INSPECTION.

8-8. All gears (including both sun gear, carrier, pins, plates, and capscrews should be cleaned in solvent. Inspect each gear for galling, nicking, chipping and cracking especially at the root of each tooth.

8-9. All bearings should be washed in solvent. Agitate in the solvent; do not use a brush as some of the bristles may break.

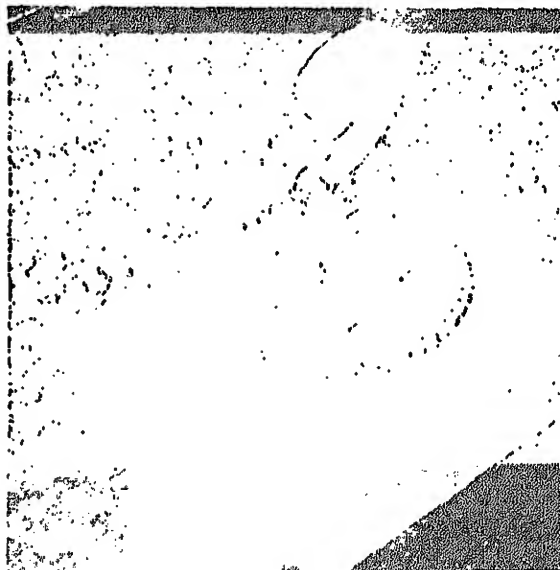


FIGURE 8-17.

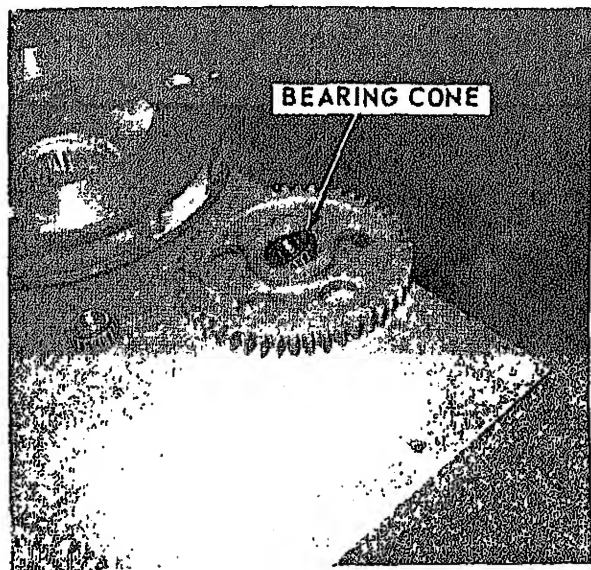


FIGURE 8-16.



FIGURE 8-18.

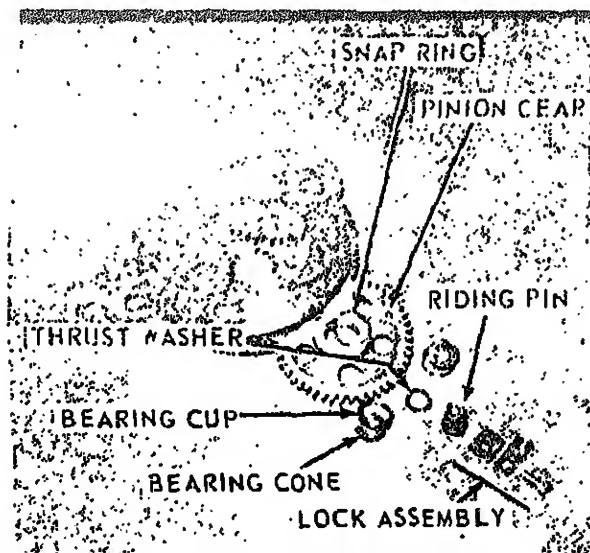
and lodge in the bearing. Blow bearing completely dry, do not spin, with compressed air. Oil bearing with light oil and rotate several times by hand. Discard bearing if rotation is not free of binding and clicking. Compare bearing looseness with a new one. Discard the bearing if there is a considerable difference. The bearing cages must be tight and the bearings free of defects. Wrap bearings in clean paper if they are not to be installed immediately.

8-10. Discard all seals, snap rings and thrust washers that are worn or scored.

8-11. REASSEMBLY AND INSTALLATION OF FINAL DRIVE ASSEMBLY.

a. Install the snap ring, bearing cups, and bearing cones in each pinion gear (see figure 8-20).

b. Matching the marks on the pinion gear and planetary carrier install one pinion gear into the planetary carrier (long hub on pinion gear away from Interlocked sun gear). Place thrust washer between pinion gear and planetary carrier on the capscrew side of the pinion gear. Align the gear, thrust washer and planetary carrier and insert the riding pin. Install the spacer, lockplate and capscrew. Rotate the planetary pinion gear to insure proper seating of the bearings and thrust washer. Torque the capscrews per specification back off one flat and lock. Then install the other two pinion gears in the same manner (see figure 8-21).

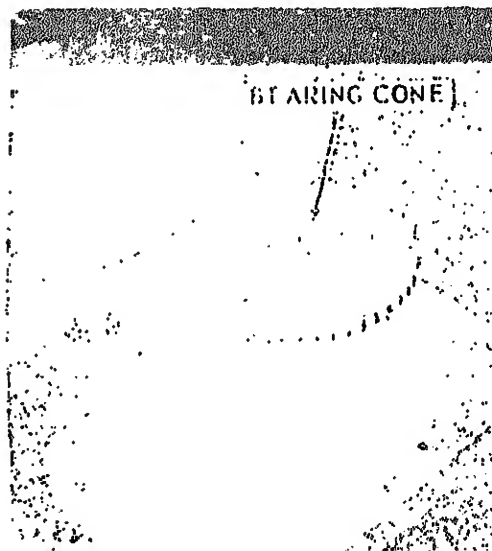


c. Assembly of Outer Planetary Assembly. Place the outer planetary assembly protective surface with the large splines upward. Note that the outer planetary do not have a longer hub as do the planetary pinions. The outer planetary are symmetrical and can be installed with either side towards the splined (figure 8-22).

d. Install the snap ring, bearing cups, bearing cones in each pinion gear. Place thrust washer between pinion gear and planetary carrier.



FIGURE 8-20A.



Rotate the planetary pinion gear to insure proper seating of the bearings and thrust washer. Torque the capscrew per specification, back off one flat and lock. Then install the other two pinion gears in the same manner (see figure 8-24).

anchor flange and tighten dust protection mounting bolts.

g. Assembly of drive drum hub. Press bearing into the drum hub (see figure 8-24).



FIGURE 8-21.



FIGURE 8-23.

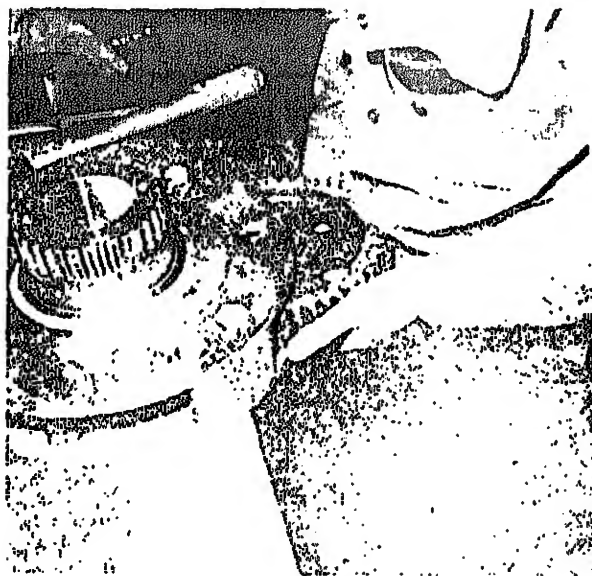


FIGURE 8-22.



FIGURE 8-24.



FIGURE 8-25.



FIGURE 8-28.

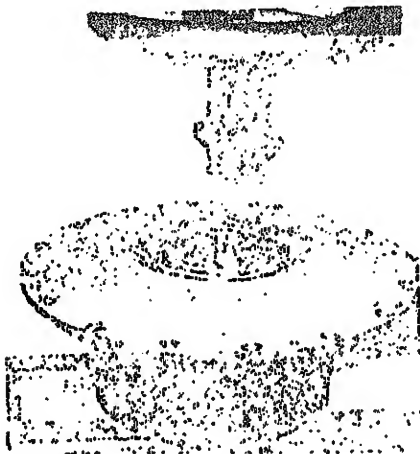


FIGURE 8-26.



FIGURE 8-29.

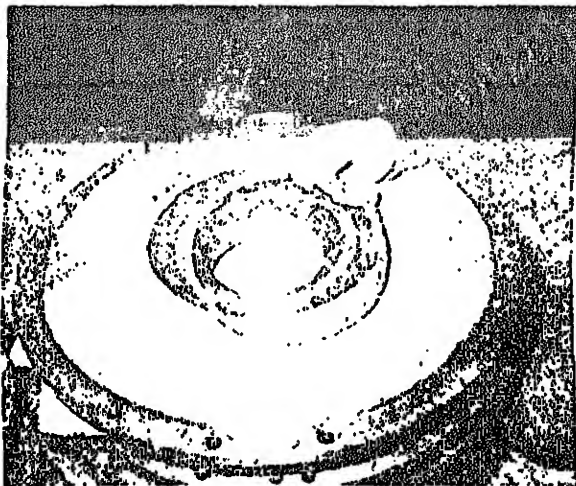


FIGURE 8-27.



FIGURE 8-30.

h. Install the large snap ring (see figure 8-27).

i. Press the oil seal into the drum hub until it bottoms against the snap ring (see figure 8-28).

j. Assembly of Inner Planetary Assembly. Install the interlocking sun gear in planetary carrier and lock it in place with the snap rings. Place the planetary carrier on a protective surface with the long hub of the interlocked sun gear down (see figure 8-29).

k. Installation of the Planetary System. If the ring gear has been removed, clean its

mounting flange and paint it with "Loctite Plastic Gasket" or equivalent (see figure 8-30).

l. Do the same to the mating machine surface of the drum (see figure 8-31).

m. Install the ring gear using a pilot stud. Using four capscrews, seat the ring gear in the drum. Remove the four capscrews (see figure 8-32).

n. Insert thrust washer first, then needle thrust bearing into the machined pilot of the interlocked sun gear of the inner planetary assembly using a heavy machine grease to hold them in the pilot (see figure 8-33).



FIGURE 8-31.

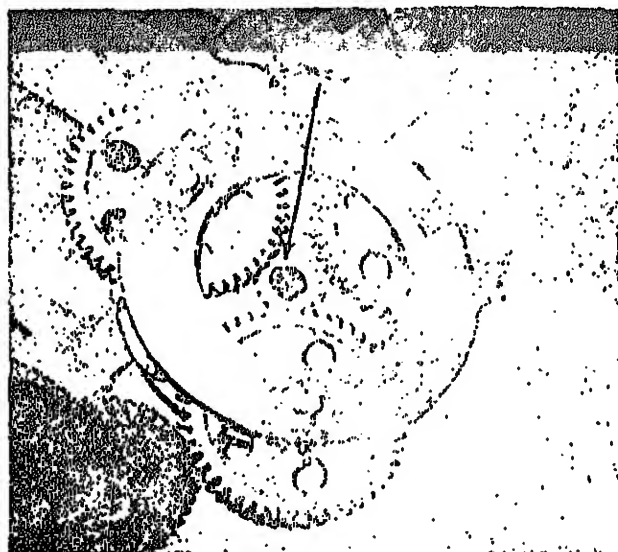
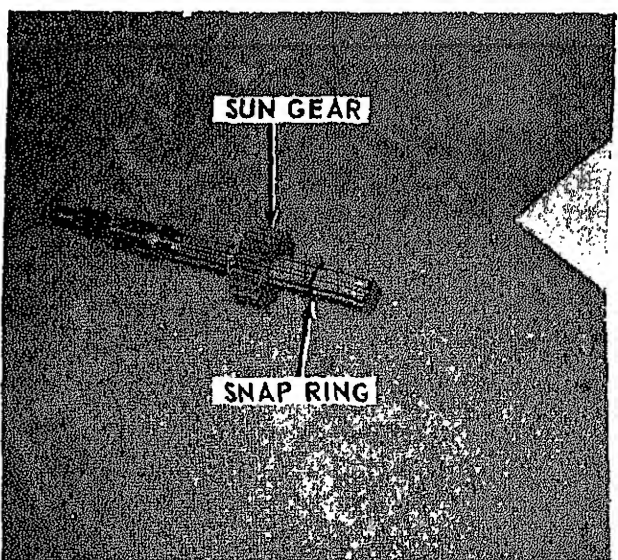
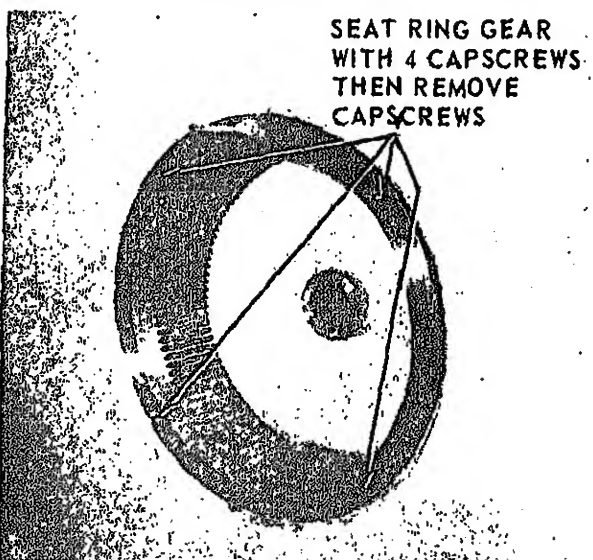


FIGURE 8-33.



SECTION 8 FINAL DRIVE

o. Install the small sun gear on the brake shaft. Then install the snap ring into its retaining groove (see figure 8-34).

p. Assemble brake shaft into inner planetary gear (see figure 8-35).

q. Install inner planetary into ring gear (see figure 8-36).

r. Apply a large amount of lubriplate. Insert thrust washer first and then assemble needle bearing into outer planetary (see figure 8-37).

s. Lift the outer planetary assembly into the ring gear, meshing the planetary pinions with

the ring gear, and push this assembly into the drum until it bottoms against the thrust washers (see figure 8-38).

NOTE: Check to see that the two planetary carriers do not touch. Also, check that the thrust needle bearings have not fallen out of place. Planetaries must be removed if these conditions are a problem.

t. Paint outer face of ring gear with "Locktite Plastic Gasket" or equivalent. Apply Lubriplate to machine boss of outer planetary (see figure 8-39).

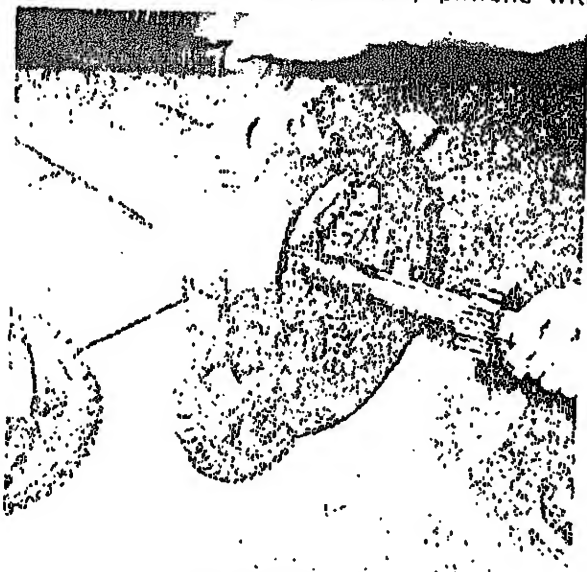
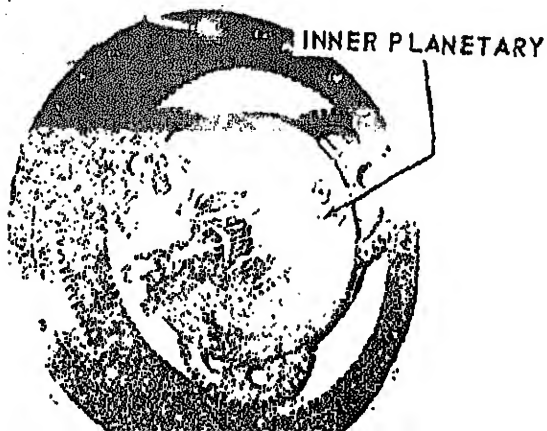


FIGURE 8-35.

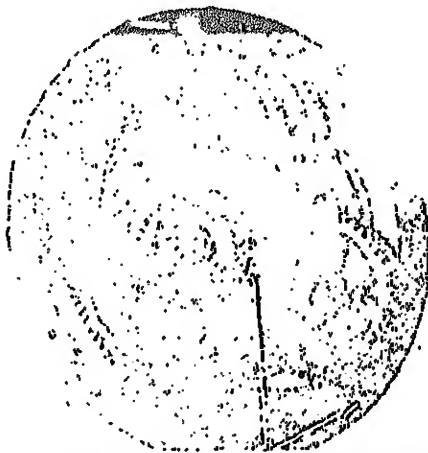


FIGURE 8-37.



w. Manufacture a puller per illustration in figure 8-42.

x. Assemble special puller onto splined



APPLY PLASTIC SEALER HERE

FIGURE 8-39.

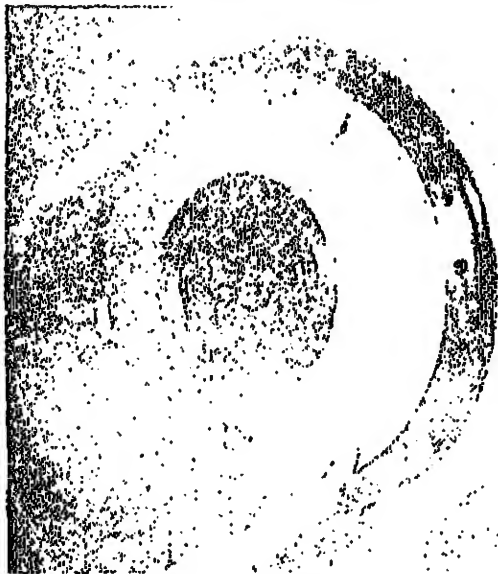


FIGURE 8-40.

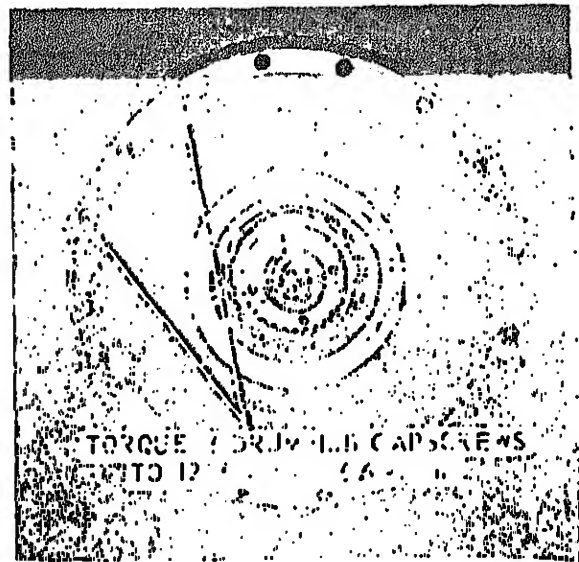


FIGURE 8-41.

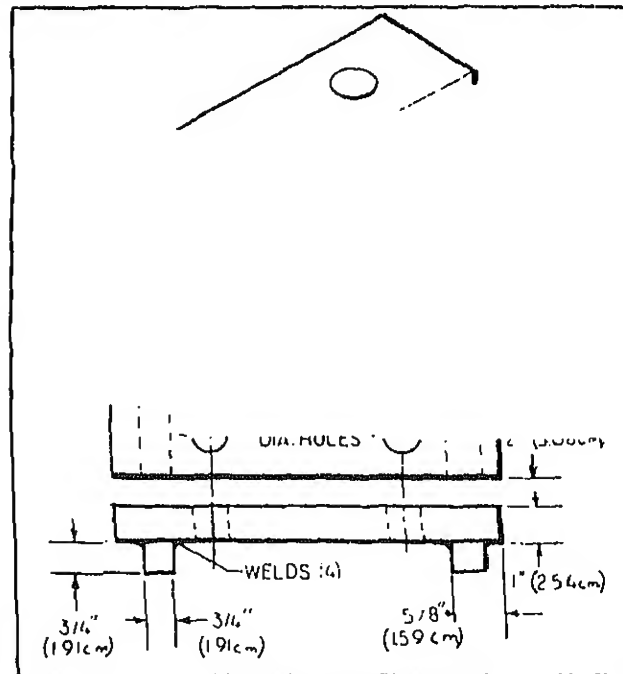


FIGURE 8-42.



FIGURE 8-43A.

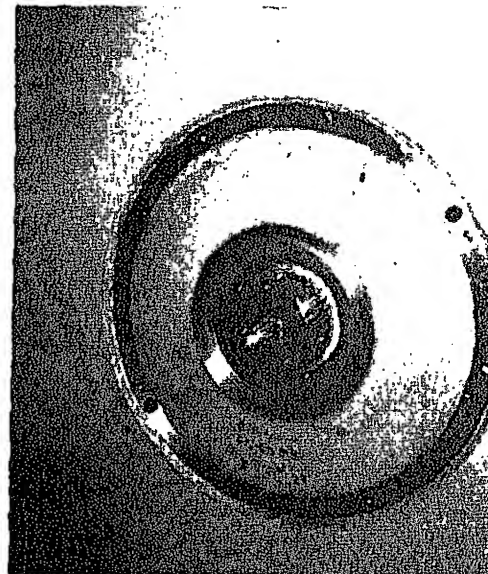


FIGURE 8-43B.

9-1. GENERAL.

9-2. This section contains a description of the steering system operation and overhaul instructions for major components. Overhaul instructions include removal, disassembly, inspection, reassembly and installation procedures. System checks and adjustments are given at the end of steering cylinder repairs. Design and performance specifications are given in Section 2. Troubleshooting instructions are given in Section 5.

9-3. DESCRIPTION (see figure 9-1).

9-4. STEERING SYSTEM.

9-5. The steering system is a hydrostatic operated, manually controlled system with provisions for manual steering. The steering system has a natural feel for the operator by provide in a direct relation between the steering wheel position and the guide roll position.

9-6. Components of the steering system are:

(1) an engine mounted hydraulic power pump

(2) the gooseneck mounted power steering control unit

(3) double acting hydraulic steering cylinder

(4) steering wheel

(5) hydraulic fluid reservoir (common with the transmission hydraulic reservoir)

(6) hydraulic lines and fittings.

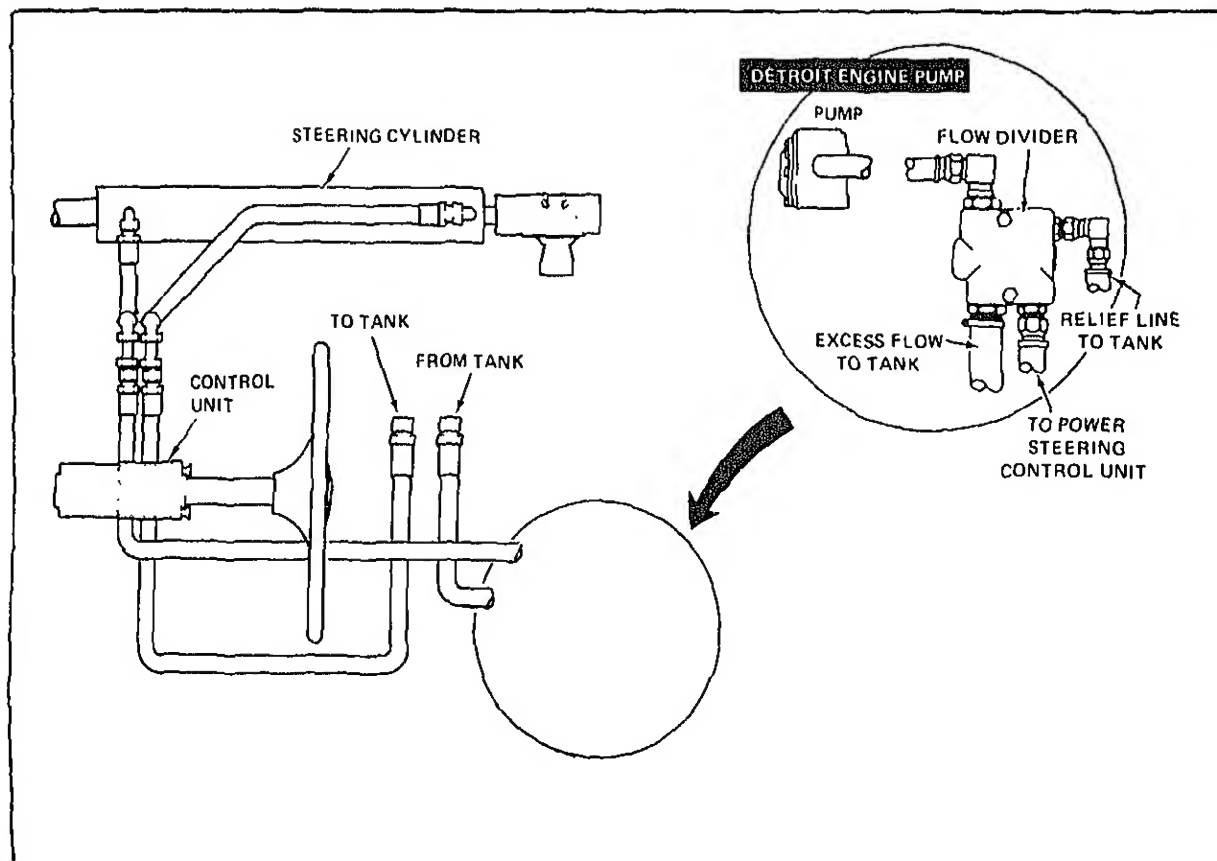
9-7. STEERING CONTROL UNIT.

9-8. DESCRIPTION (see figure 9-2).

9-9. The steering control unit is an open-center rotary actuated unit consisting of three major sections:

(1) a column section

(2) control section



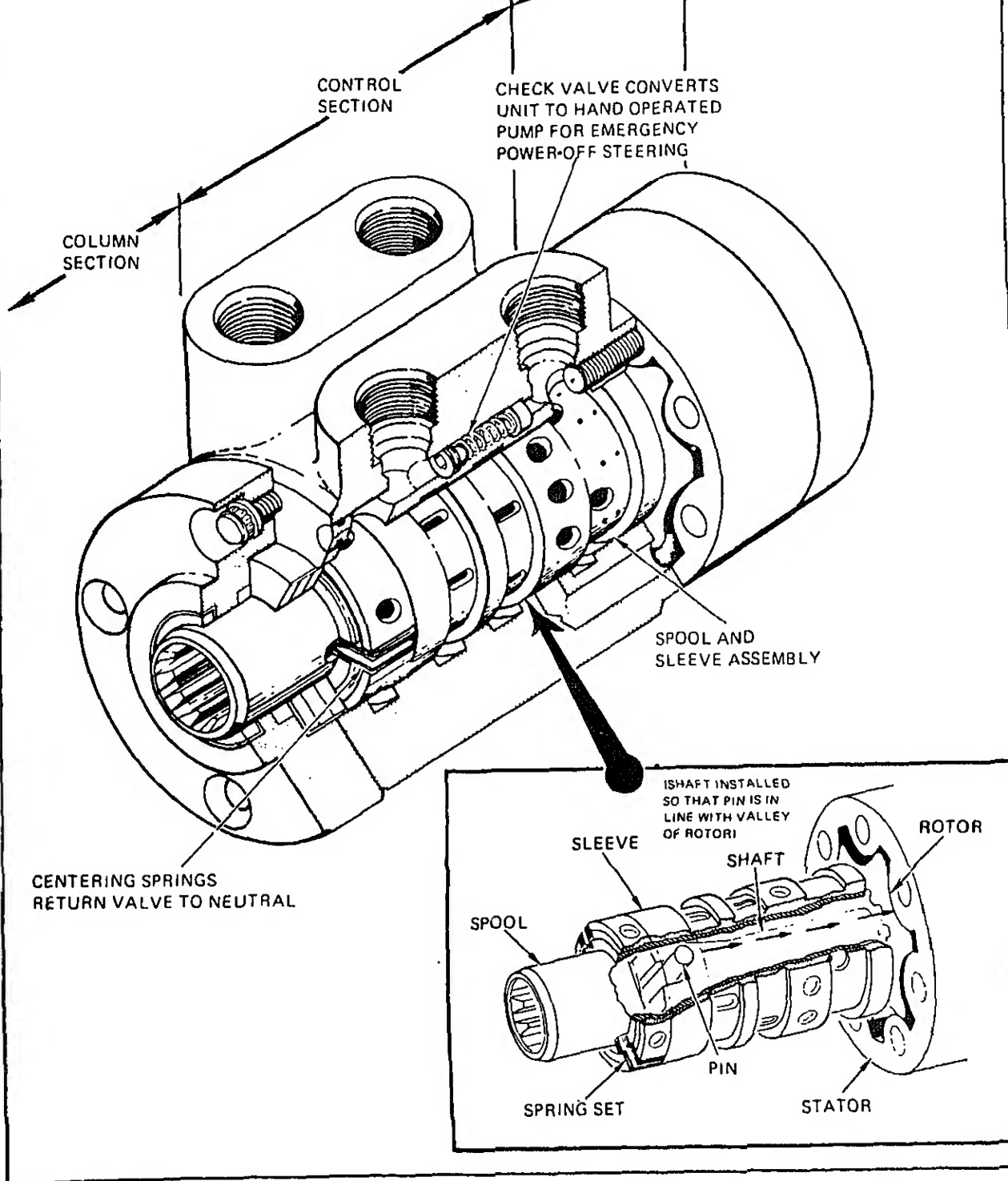


FIGURE 9-2.

The column section provides a means of mounting and actuating the control and metering sections. The control section distributes the oil to and from the metering section. The metering section determines the quantity of oil delivered to the control section.

9-10. The column section consists of a splined shaft and housing assembly. The unit steering wheel is splined to one end of the shaft. The opposite end of the shaft is splined into the control section spool to rotate the spool for distribution of oil.

9-11. The control section consists of a spool and sleeve assembly, six centering springs and a manual steering check valve mounted in a cast housing. The housing also contains an inlet port, a dump port and two steering cylinder ports. The spool is fitted into the center of the sleeve and is held in place in the sleeve by a straight pin and the set of six centering springs. The pin extends through the sleeve and two radial slots in the spool. The pin is a tight fit in the sleeve and a loose fit in the spool. The centering springs extend through the spool and out each side of the sleeve so that they return the spool to the center position. The spool contains a series of porting holes that align with similar holes in the sleeve when the spool is rotated off of the center position.

9-12. A shaft with a radial slot at one end and splines at the opposite end connects the control section to the metering section. The slotted end of the shaft mates with the straight pin extending through the spool. The splined end fits into the center of the rotor set closest to the control section. The control section is also attached to the metering section through a porting plate.

9-13. The metering section consists of a rotor set (metering element) which is connected to the control section spool. The rotor set consists of a matched rotor and stator.

9-14. The stator has seven concave configurations (serving as oil cavities). It also contains the same number of convex configurations, each one being diametrically opposite a cavity. The rotor contains six lobes that are formed to mate with the stator cavities. Each lobe has a diametrically opposite lobe; therefore when one rotor is in a cavity of the stator, its opposite lobe is at the crest of the stator convex

interaction between the rotor and stator are 42 overlapping fluid discharging action one revolution of the rotor.

9-15. OPERATION (see figure 9-2).

9-16. Rotation of the steering wheel a three main components in the steering unit:

(1) The control section spool

(2) The control section sleeve

(3) The metering element (rotor) metering section.

When the steering wheel is stationary the control section spool and sleeve are held in center position by the six centering springs. During this condition, oil is received from the system hydraulic pump and is routed to the tank.

9-17. As the steering wheel is turned the spool just begins to rotate, the springs tend to rotate the sleeve to maintain the "center" relationship between the spool and sleeve. However, the force required to rotate the rotor set is greater than the spring force and the springs start to flex. This "flex" action permits the spool to move with the sleeve (approximately 1/8 inch) until the ends of the spool slots contact the straight pin extending through the sleeve and the spool is in this position, the porting holes in the sleeve and spool are aligned. This permits the oil to flow to the metering section and out one of the cylinder ports.

9-18. Further rotation of the steering wheel causes the spool to rotate the pin, which turns the sleeve and the rotor in the metering section. At this time, oil is being metered to the metering section and is allowed to flow through the spool and sleeve to one side of the steering cylinder. The porting arrangement allows the oil to flow from the opposite side of the cylinder, through the control section, back to the hydraulic tank. The output of the metering section is directly proportional to the speed and distance that the steering wheel rotates.

9-19. When rotation of the steering wheel stops, the metering action in the metering section also stops. The six centering springs then return the sleeve to the "center" (open-center) position. When this

maintain guide roll position, but all incoming oil from the system pump flows back to the tank. To return the guide roll to the straight ahead position, the steering wheel must be rotated in the opposite direction. The control unit will then function as described, but all parts will rotate in the opposite direction.

9-20. REMOVAL OF STEERING CONTROL UNIT.

a. Remove the horn cover and lock ring, then lift the horn button assembly from the steering wheel (see figure 9-3).

b. Remove steering wheel jam nut and use a puller to remove steering wheel. Then remove the two countersunk mounting capscrews from the gooseneck (see figure 9-4).



FIGURE 9-3.

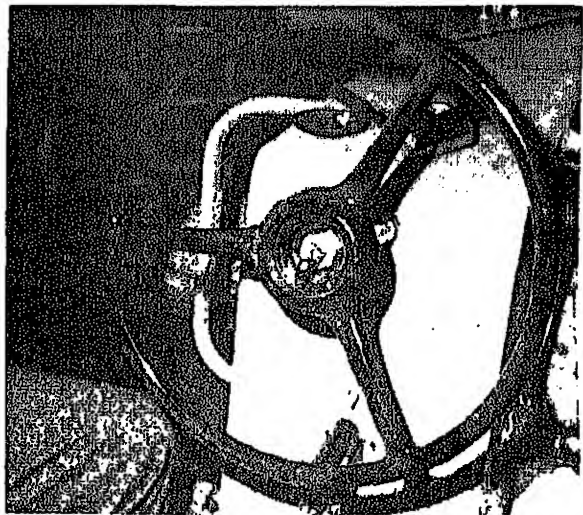


figure 9-5).
d. Disconnect the two hydraulic hoses and the water spray hose. Plug or cap all hoses and fittings (see figure 9-6).

NOTE: Mark the hydraulic hoses as to position with respect to the steering cylinders.

e. Disconnect the inlet hose from the pump and the return hose from the tank. Plug or cap all hoses and fittings. Remove the control unit and hoses from the gooseneck opening (see figure 9-7).

9-21. DISASSEMBLY OF STEERING CONTROL UNIT (see figures 9-2 and 9-8).

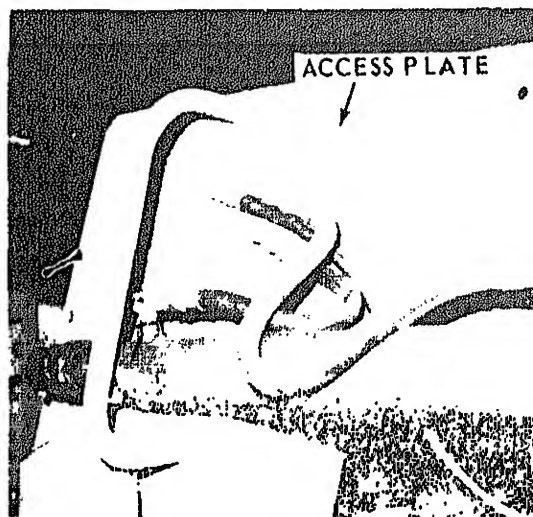


FIGURE 9-5



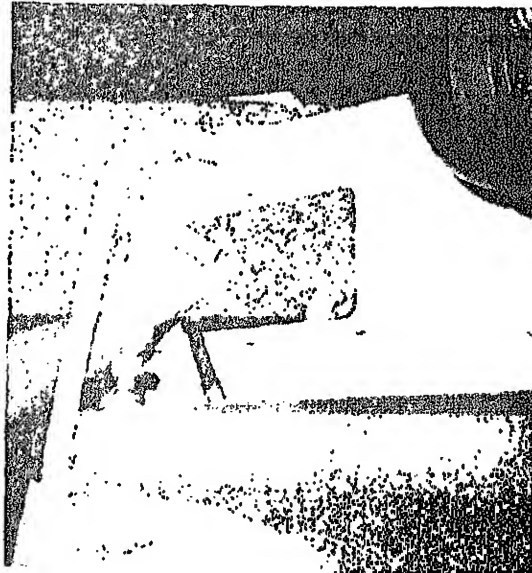


FIGURE 9-7.

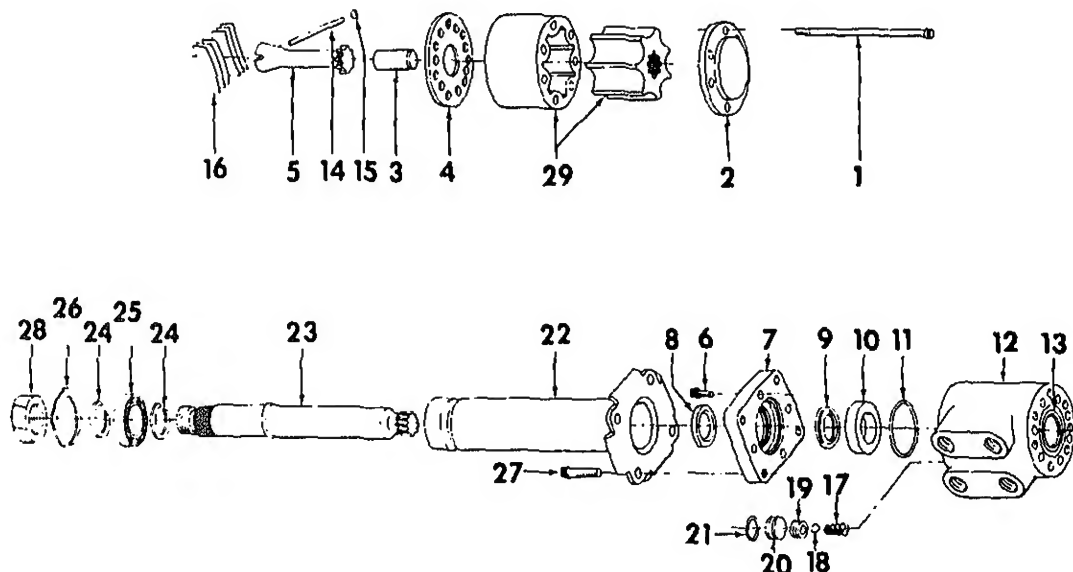
a. Place the unit in vise, control
Clamp across port surface and opposit
housing lightly. Remove the two ca
that fasten column to lower unit.
column and set aside. Mark the capscre
so that the ports will be in the proper
when reassembled (see figure 9-9).

b. Clamp unit in vise across mount
edges with meter end up and re
capscrews (see figure 9-10).

c. Lift off metering section (see figur
9-12, and 9-13).

d. Remove control assembly from v
check for free rotation of the control s
sleeve parts with column shaft (see
9-14).

e. Place clean wooden block across
throat to support spool parts and cla



- 1 CAPSCREW
- 2 CAP-END
- 3 SPACER
- 4 PLATE
- 5 DRIVE
- 6 CAPSCREW
- 7 CAP HOUSING
- 8 SEAL-OIL
- 9 SEAL-QUAD RING
- 10 BUSHING-CAP LOCATER
- 11 O-RING
- 12 HOUSING-VALVE
- 13 SLEEVE AND SPOOL
- 14 PIN-CENTERING
- 15 DISC-PIN

- 16 SPRING-CENTERING
- 17 SPRING
- 18 BALL-STEEL, 1/4
- 19 SEAT-CHECK
- 20 PLUG-SEAL
- 21 O-RING
- 22 STEERING-COLUMN
TUBE AND FLANGE
- 23 SHAFT
- 24 SNAP-RING
- 25 BEARING
- 26 RING-RETAINING
- 27 CAPSCREW-3/8 UNC X 3/4
- 28 NUT-13/16 NEF
- 29 GEAR SET

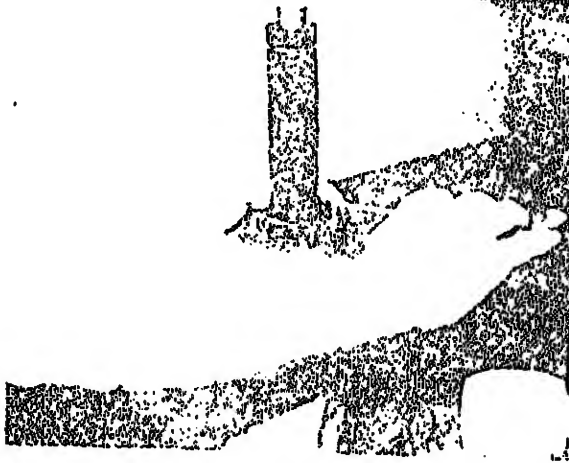


FIGURE 9-9A.

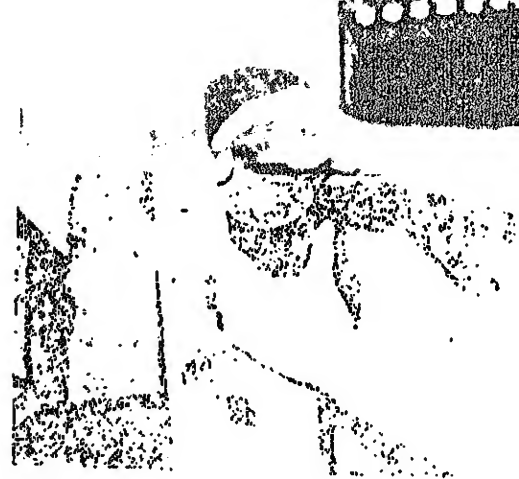


FIGURE 9-11.

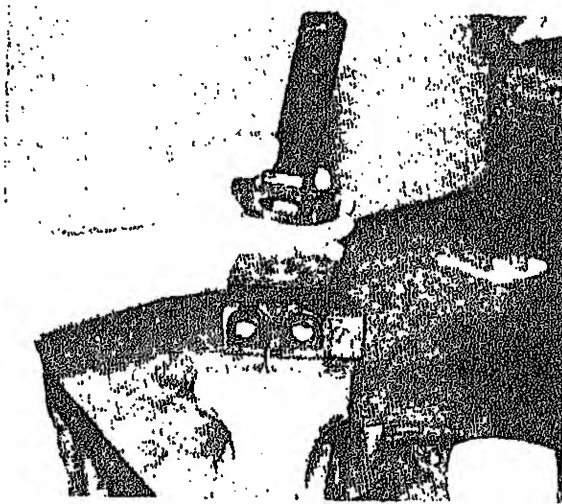


FIGURE 9-9B.



FIGURE 9-12.

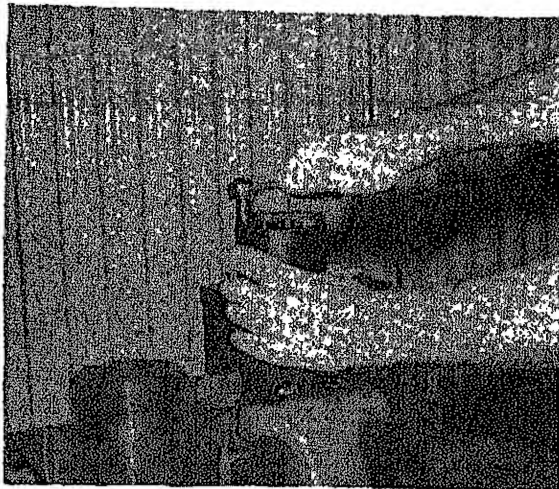


FIGURE 9-10.

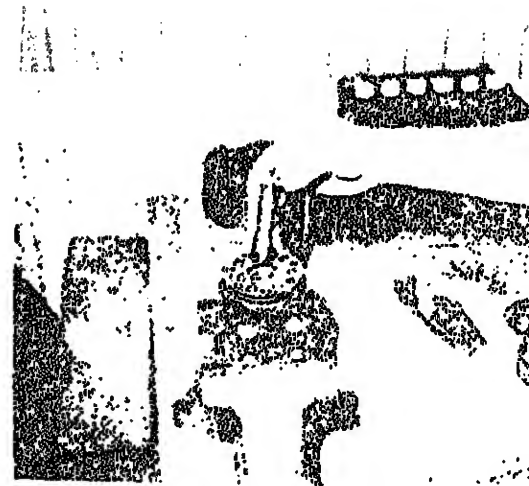


FIGURE 9-13.

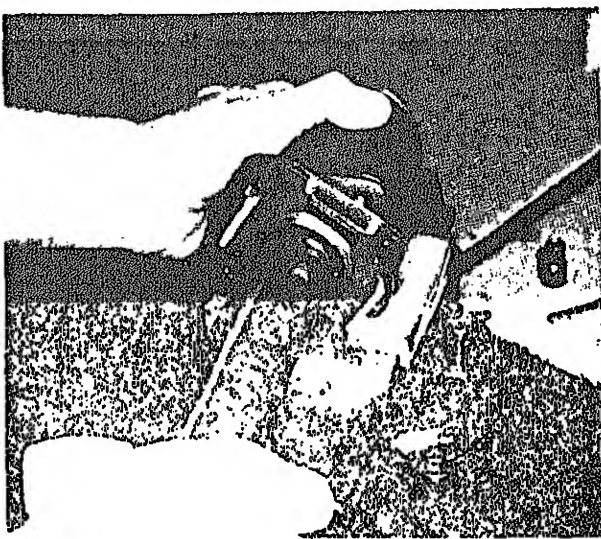


FIGURE 9-14.

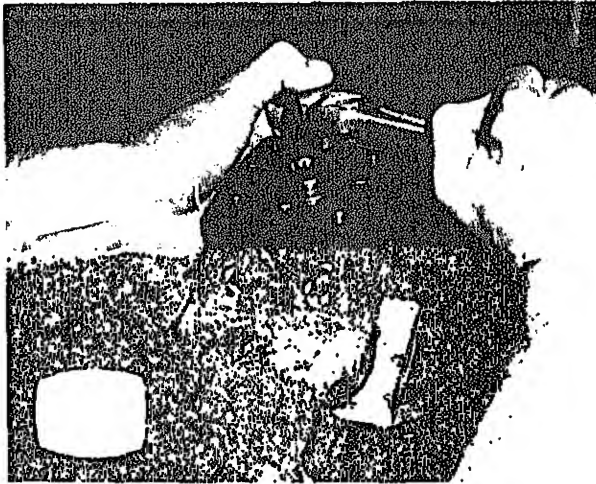


FIGURE 9-15.



across port face with control end up and set aside four (4) cap screws (see figure 9-15).

f. Hold spool assembly down against housing in vise and lift off end cap (see figure 9-16).

g. Inspect mating surfaces for leakage path, wear, seal condition (see figure 9-17).

h. Remove cap locator bushing (see figure 9-18).

i. Place housing on solid surface face down so that it can be held steady. Remove spool-sleeve assembly from end of housing (see figure 9-19).



FIGURE 9-17.



j. Be extremely careful to prevent these parts from binding as they are very closely fitted and must generally be rotated slightly as they are withdrawn (see figure 9-20).

k. Using a small bent tool or wire, the check valve seal can be removed by pushing on it, reaching it through the "out" port. Do not pry against edge of hole in housing bore (see figure 9-21).

l. Place housing in vise, control end up, and unscrew check valve seat with 3/16 inch hex wrench (see figure 9-22).

m. Up-end the housing and tap slightly with butt of hand. Hold check valve hole toward lowest corner and remove check valve seat, ball and spring (see figure 9-23).

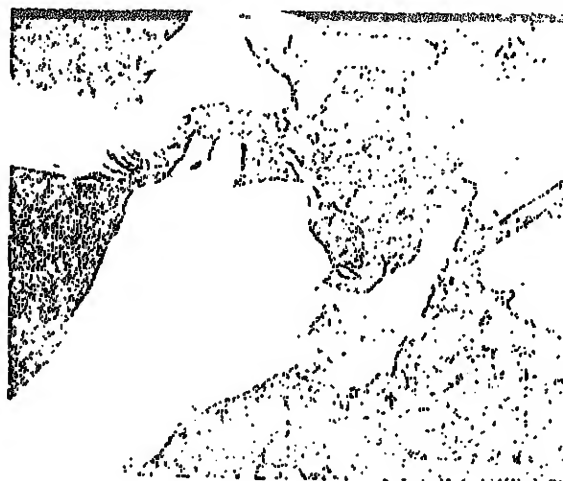


FIGURE 9-21.



FIGURE 9-19.

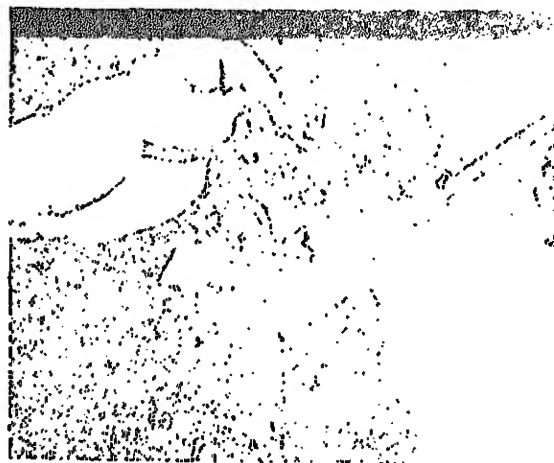
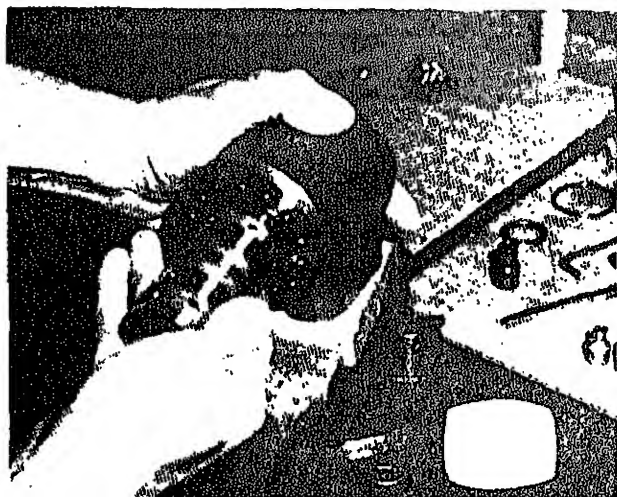


FIGURE 9-22.



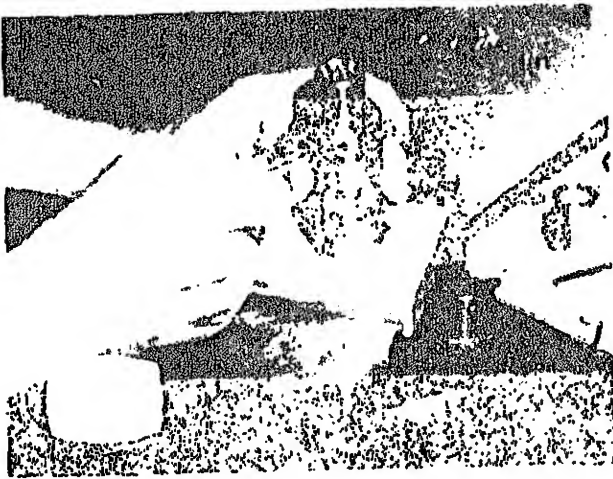


FIGURE 9-24.

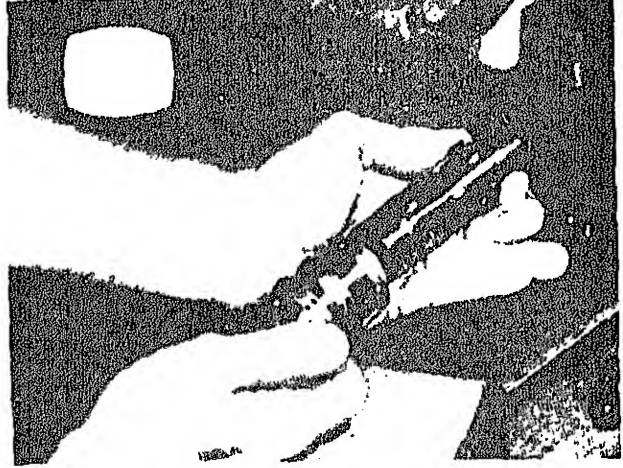


FIGURE 9-27.

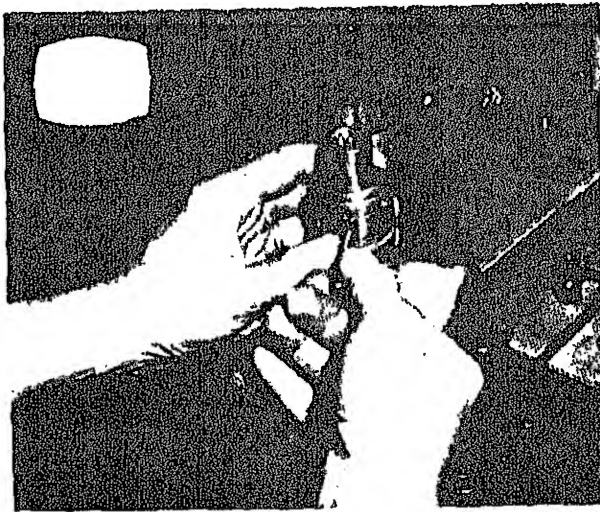


FIGURE 9-25.

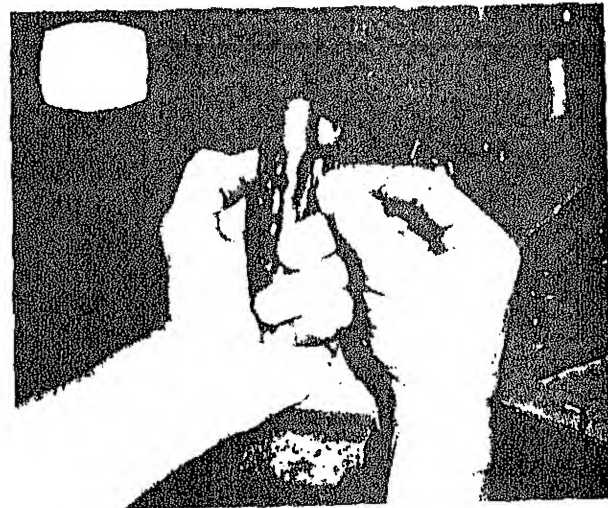
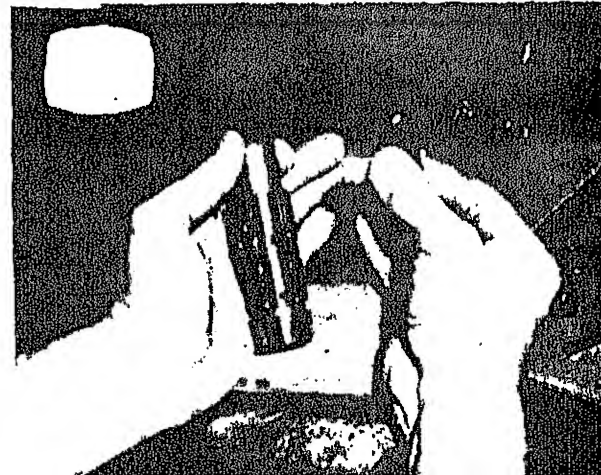
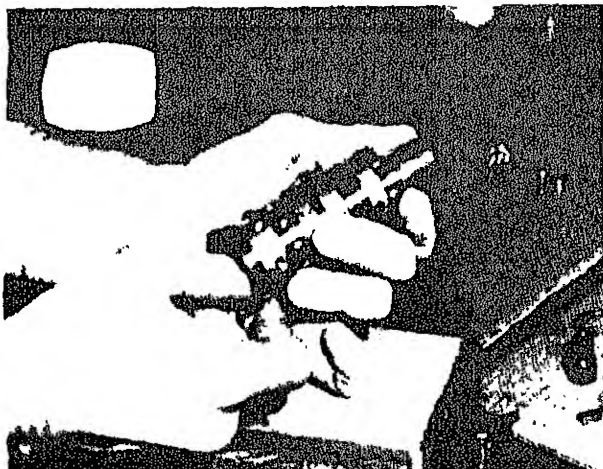


FIGURE 9-28.



spool moves towards splined end and remove carefully from sleeve (see figures 9-26 and 9-27).

p. Push centering spring set out of spring slot in spool (see figures 9-28 and 9-29).

9-22. INSPECTION.

9-23. Each part should be rinsed carefully in clean solvent, even such exterior parts as all capscrews and all seals that appear to be reusable. If in doubt, replace with new seals. It is good service policy to replace all seals when unit is reassembled. They are available in kit form. Rinsing and cleaning can be done while other parts of the unit are being disassembled and parts can be set to dry on clean paper towel. The meter gear set must be disassembled and cleaned similarly.

9-24. Inspect all moving surfaces to insure that they have not been scored or abraded by dirt particles or otherwise disrupted. Smooth burnished surfaces are normal in many areas. Slightly scored parts can be cleaned with 600 grit abrasive paper by hand rubbing only.

9-25. To prepare all surfaces of the meter section for reassembly and insure that all edges of the parts are burr free, place a piece of 600 grit abrasive paper face up on an

can be used for this purpose if necessary. Then both sides of the ring gear, both sides of the plate, the 14 hole end of the housing and the flat side of the end cap should be cleaned lightly.

9-26. Stroke each surface across the abrasive several times and observe the part (see figures 9-30, 9-31 and 9-32). Any small bright area on an edge indicates a burr which must be removed. Hold the part so that contact with the abrasive is as flat as possible (Do not hold one edge down hard or the part will be rounded). Check each part after 6 to 10 strokes across the abrasive. After polishing each part, rinse clean in solvent and blow dry. Keep parts absolutely clean until they are assembled.

9-27. REASSEMBLY OF STEERING CONTROL UNIT.

CAUTION: Observe the shaft-to-rotor alignment procedures specified in figure 9-28. Do not oil any component prior to reassembly. The sealing of one component to another is dependent on lapped surfaces. Seepage may occur as a result of dust retained on an oil film. Blow all parts dry with compressed air prior to reassembly.

a. Place housing in vise with control end



FIGURE 9-30.

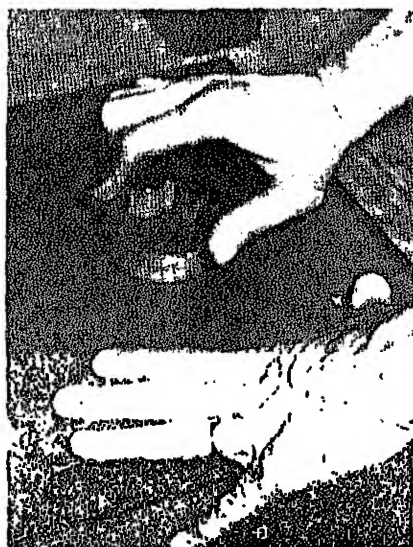


FIGURE 9-31.



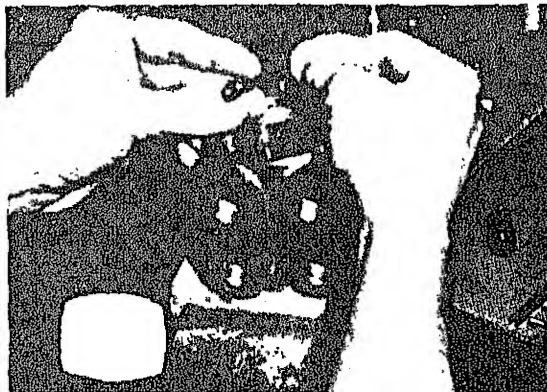
FIGURE 9-32.



FIGURE 9-33.



FIGURE 9-34.



Protect 14 hole end and clamp across surface lightly. Drop check valve spring check hole with large end down (see 9-33).

b. Drop check ball into check hole insure that it rests on top of the small the spring within the hole (see figure Place the check valve seat on hex v and screw into threads within check h that the machined counterbore of the seat is towards the ball (see figure 9-35).

c. Torque check seat to 12.5 ft.-lbs. kg-m) (see figure 9-36). Test check ball by pushing ball with small clean pin a spring force. Ball need NOT be snug a seat for proper function.

d. Install spool within sleeve carefully that spring slots of both parts will be a end. Rotate while sliding parts together figures 9-37 and 9-38). Test for free r Spool should rotate smoothly in sleeve finger tip force applied at splined end.



FIGURE 9-36.



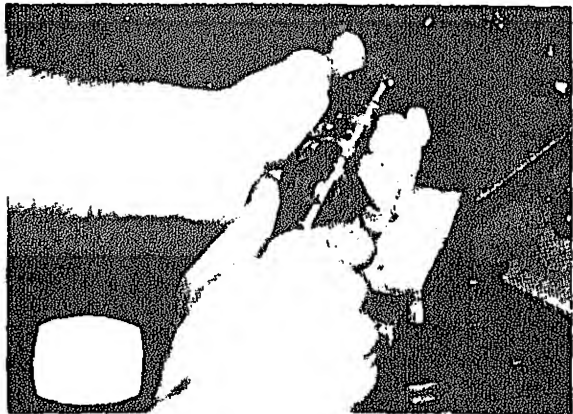


FIGURE 9-38.

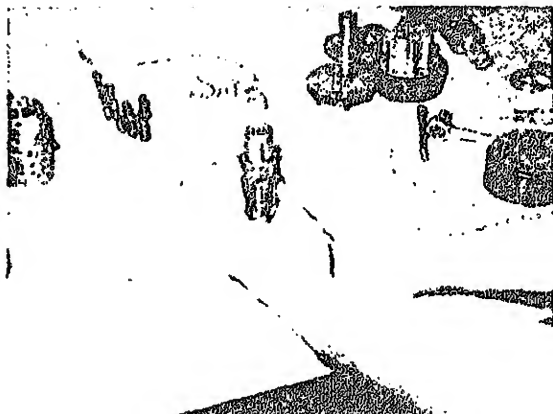


FIGURE 9-41.

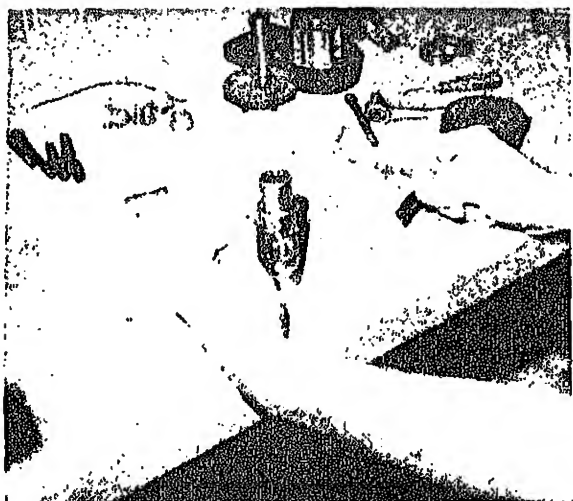


FIGURE 9-39.

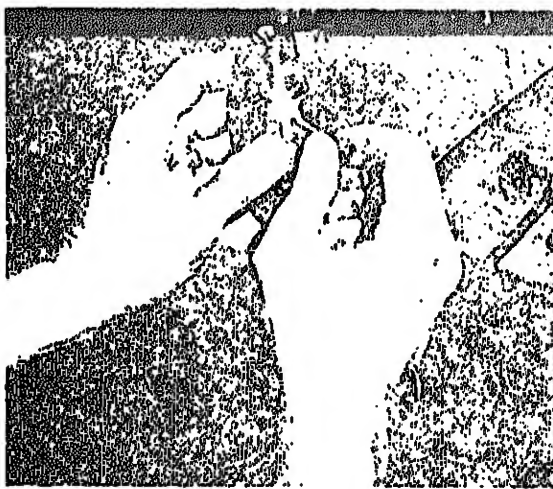
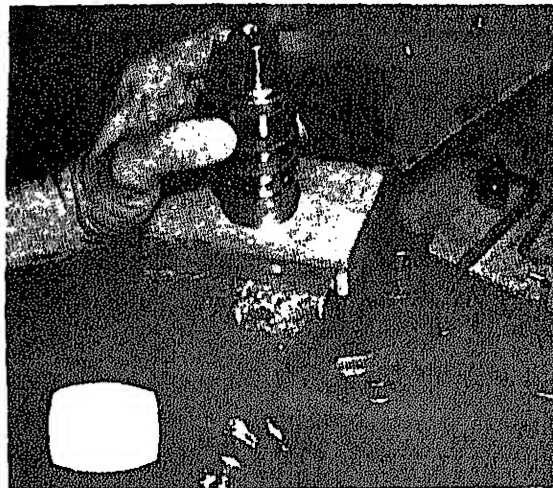
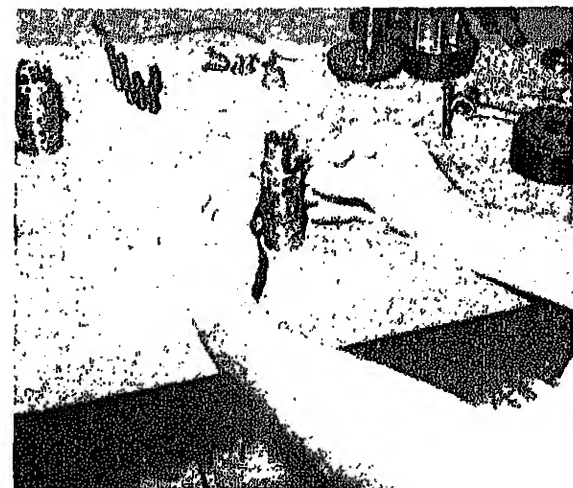


FIGURE 9-42.



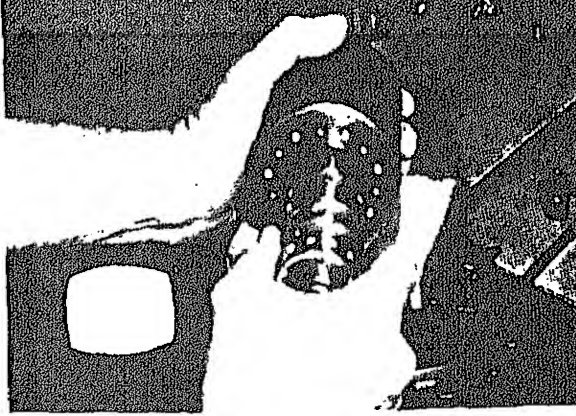


FIGURE 9-44.

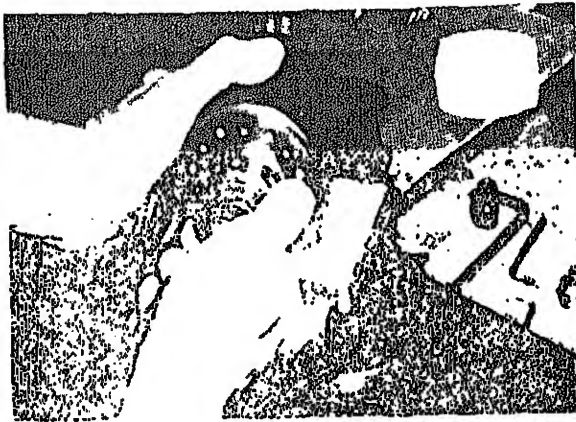


FIGURE 9-45.



FIGURE 9-46.

and stand on end of bench. Position 3 pairs of centering springs (or 2 sets of 3 pairs each) on bench so that extended edge is down and arched center is together. Enter one end of each spring set into slot just far enough to edge opposite side (see figure 9-39).

f. Enter second spring set from opposite side from installed spring set. Work the second set around until spring set enters slot on opposite side. The two spring sets will have tension between them at their arches (see figure 9-40).

g. Center the spring set so that they are down evenly and flush with the upper surface of the spool and sleeve (see figure 9-41).

h. Install cross pin through spool assembly (see figure 9-42).

i. Push into place until cross pin is flush slightly below the sleeve diameter at both ends (see figure 9-43).

j. Position the housing on a solid surface with the port face down. Start the assembly so that the splined end of the spool enters the 14 hole end of the housing first (see figure 9-44).

k. Be extremely careful that the parts do not cock out of position while entering. Push the spool gently into place with slight rotating motion (see figure 9-45). Bring the spool assembly entirely within the housing bore until the ends are flush at the meter end or 14 hole end of the housing. Do not pull the spool assembly beyond this point to prevent the cross pin from dropping into the discharge groove (see figure 9-46).

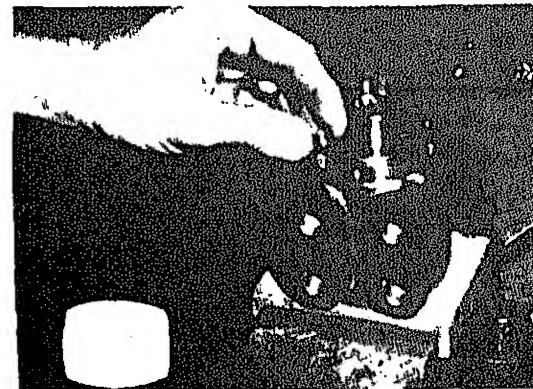


FIGURE 9-47.

position, check for free rotation within the housing by turning with light finger force at the splined end (see figure 9-46). Hold the parts in this flush position and rest the 14 hole end of the assembly on the protective block on the vise and clamp lightly across the port face with the vise.

NOTE: It is good service policy to replace all seals when unit is reassembled. They are available in kit form.

NOTE: Do not force the spool into the housing. If it will not slide in freely. The assembly tolerance is so close that the temperature of your hand can expand metal of the spool enough that it will not slide in the housing.

l. Check the condition of the o-ring seal on the check plug and replace it if necessary. Install the check plug in the check hole with a steady pressure while rocking it slightly so that the o-ring feeds in smoothly without cutting (see figures 9-47 and 9-48).

m. Position the cap locator bushing with large O. D. chamfer UP partly into end of housing (see figure 9-49). Insure that it seats against spool assembly flat and smooth by rotating with finger tips.

n. Check the mounting plate and shaft seal carefully to insure that they are clean and in good condition. Insure that the mounting plate seal grooves are clean and smooth. Each of these seals are slightly larger than its seal grooves so that they will be adequately retained in service. Push each gently into place and smooth down into seal groove with finger tip (see figure 9-50).

o. Thin oil seal at exterior of mounting plate is a dirt exclusion seal and does not generally need replacement. If this is replaced, it should be pressed into counterbore so that the lip is directed away from the unit.

p. Place the mounting plate sub-assembly over spool shaft and slide down into place over cap locator bushing smoothly so that seals will not be disrupted in assembly (see figure 9-51). Be certain that the mounting plate rests fairly flush against the end of housing assembly so that the cap locator bushing is not cocked and install four mounting plate capscrews. Tighten these evenly and gradually to a torque setting



FIGURE 9-48.



FIGURE 9-49.



FIGURE 9-50.





FIGURE 9-52.

q. Reposition in vise and clamp across the edges of the mounting plate lightly. Check to insure that the spool and sleeve are flush or slightly below the 14 hole surface of the control housing (see figure 9-53).

r. Clean the upper surface of the housing by wiping with the back of a clean hand or the butt of the thumb. Clean each of the flat surfaces of the meter section parts as it is ready for assembly in a similar way (see figure 9-54).

s. Place the plate over this assembly so that the bolt holes in the plate align with the tapped holes in the housing (see figure 9-55). Place the meter gear ring on the assembly so that the bolt holes align (see figure 9-56).

t. Place the splined end of the drive within the meter gear star so that the slot at the control end of the drive is in alignment with the valleys between the meter gear teeth (see figure 9-57). Push the splined end of the drive



FIGURE 9-54.

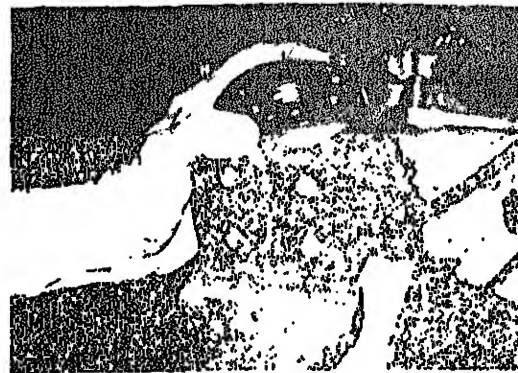


FIGURE 9-55.

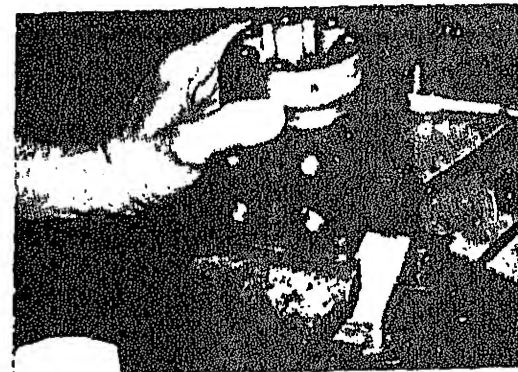
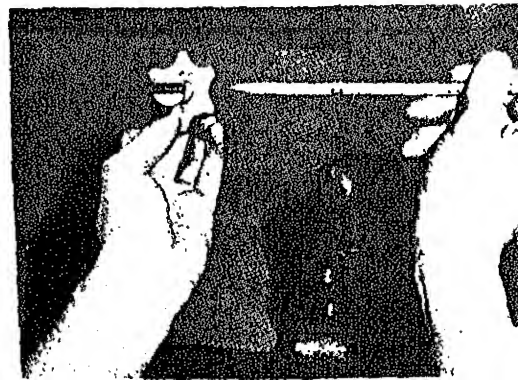
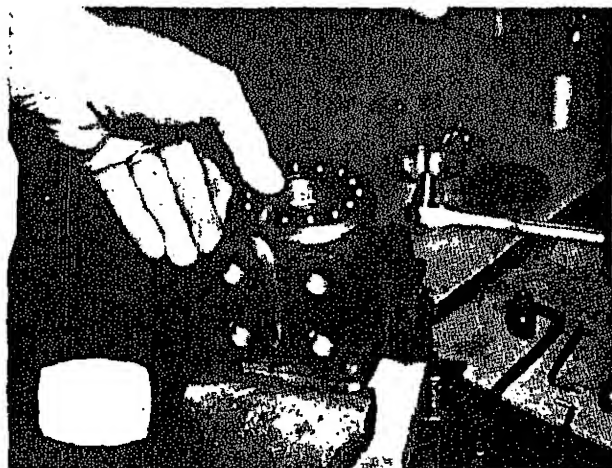


FIGURE 9-56.



through the gear so that the spline extends about one half its length beyond the meter gear star and hold it in this position while installing into the unit. Note the position or direction of the cross pin within the unit. Enter the meter gear star into the meter gear ring and wiggle the parts slowly in position so that the drive does not become disengaged from the meter gear star. Hold the plate and meter gear ring in position on the assembly while the star is being installed. Rotate the meter gear star slightly to bring the cross slot of the drive into engagement with the cross pin and the splined end of the drive will drop down against the plate (see figures 9-58, 9-59 and 9-60).

WARNING: Alignment of the cross slot in the drive with valleys between the teeth of the meter gear star determines proper valve timing of the unit. There are 12 teeth on the spline and 6 pump teeth on the star. Alignment is exactly right in 6 positions and exactly wrong in 6 positions. If the parts slip out of position during this part of assembly, repeat until you are certain correct alignment is obtained (see figure 9-57).

u. Place the spacer in position within the end of the meter gear star (see figure 9-61). If the spacer does not drop flush with the gear surface, the drive has not properly engaged the cross pin - **RECHECK**. Place the meter end cap over the assembly and install two (2) capscrews, finger tight, to maintain alignment of the parts (see figure 9-62). Install all seven capscrews and bring them gradually and evenly to 12.5 ft.-lbs. (1.728 kg-m) (see figure 9-63).

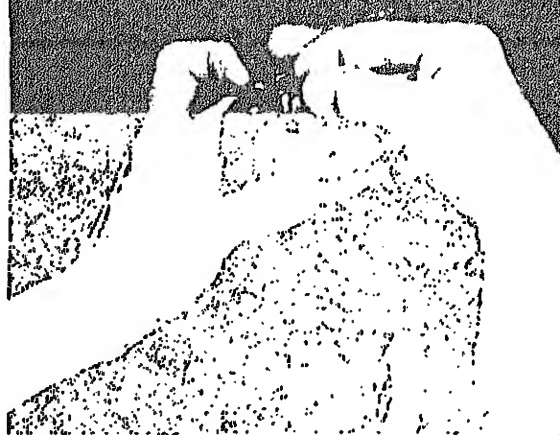
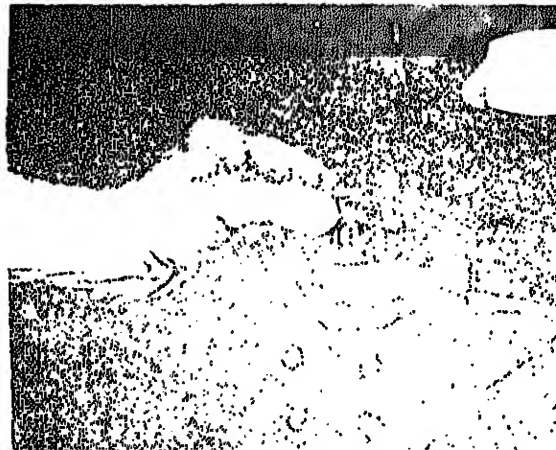


FIGURE 9-59.



FIGURE 9-60.



SECTION 9 STEERING

v. Check the condition of the column assembly, clean it, and replace on the unit with two capscrews oriented as before. Rotate the steering shaft while bringing the surfaces into contact to allow splines to engage (see figure 9-64). If in doubt, follow the orientation as shown. Tighten capscrews to 23.3 ft.-lbs. (3.22 kg-m) (see figure 9-65).

9-28. INSTALLATION OF STEERING CONTROL UNIT.

9-29. Install the steering control unit by reversing procedure presented in paragraph 9-19. Install hydraulic hoses per illustration figure 9-66.

CAUTION: Complete bleeding the system procedure paragraph 9-83 before returning unit to service.



FIGURE 9-62.

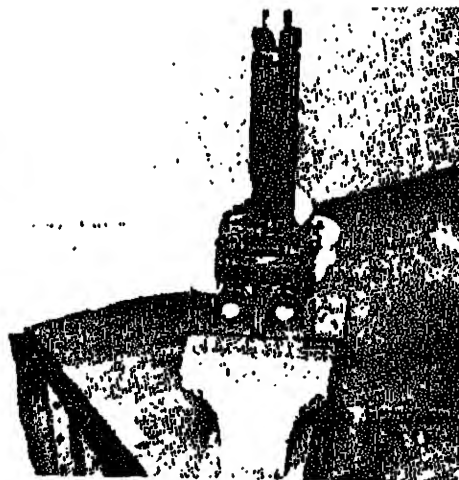
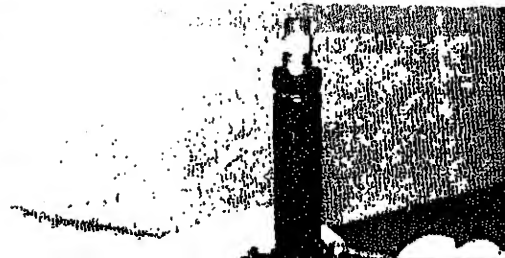


FIGURE 9-64.



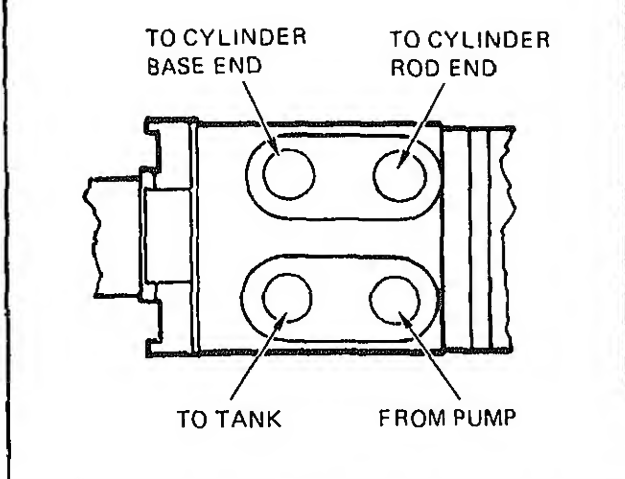


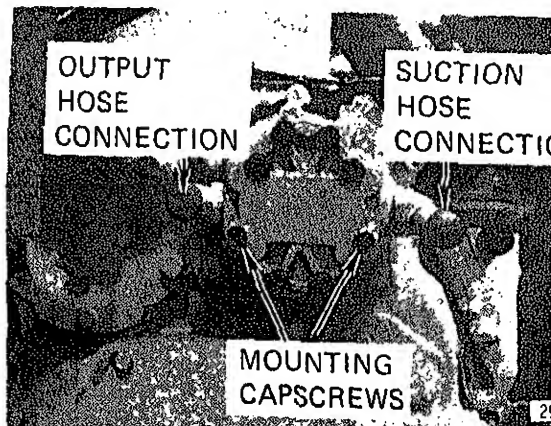
FIGURE 9-66.

9-52. STEERING PUMP (DETROIT DIESEL UNITS).

9-53. DESCRIPTION.

9-54. The steering pump is a positive displacement gear pump. It is located at the right of the Detroit Diesel engine and is gear driven (see figure 9-82).

9-55. The pump (see figure 9-91) is made of a housing, two gears, four bearings, a front cover and a rear cover. Pressure loading on the front bearing assures correct gear-to-bearing clearance. During pump operation, pressure oil is directed to an area between the front cover and bearings, forcing them toward the gears. Pressure from the outlet side of the pump is against the opposite side of the bearings. When the two pressures



gears and bearings, and actual gear-to-bearing contact is prohibited.

9-56. Oil is prevented from by-passing the body and end covers by neoprene gaskets between the components. A replaceable low pressure shaft seal is pressed into the front cover. Communication of the high pressure and low pressure oil between the bearings and front cover is prevented by a "W" shaped seal.

9-57. DISASSEMBLY OF STEERING PUMP.

a. Clean pump exterior. Remove woodruff key and capscrews. Separate rear cover from body. Remove and discard gasket. Remove front cover. Remove and discard front cover gasket. Lift out "W" shaped gasket seal and neoprene spacer (see figure 9-83). Drive out shaft seal.

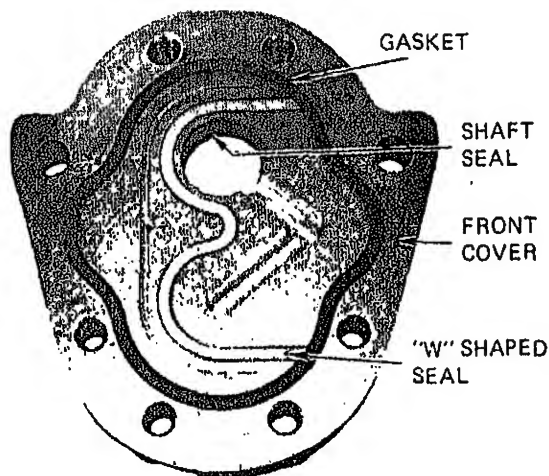
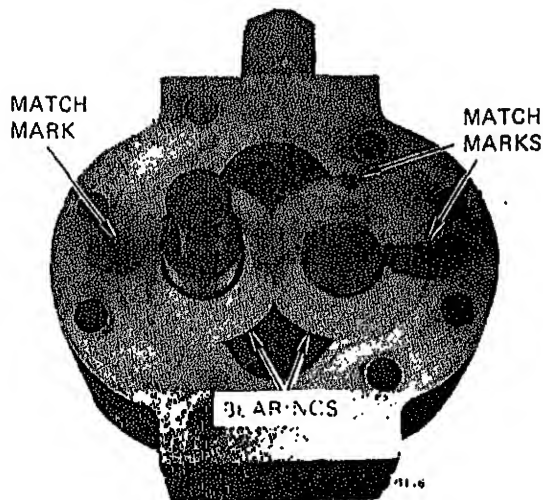


FIGURE 9-83.



bearings and body (see figure 9-84). Do not scratch; use Prussion blue for marking pump parts. Push on rear of gear shafts. Front bearings are free of the housing (figure 9-85). Remove bearings. Mark reposition of gears, then extract gears. Mark and remove rear bearings.

9-58. CLEANING AND INSPECTION.

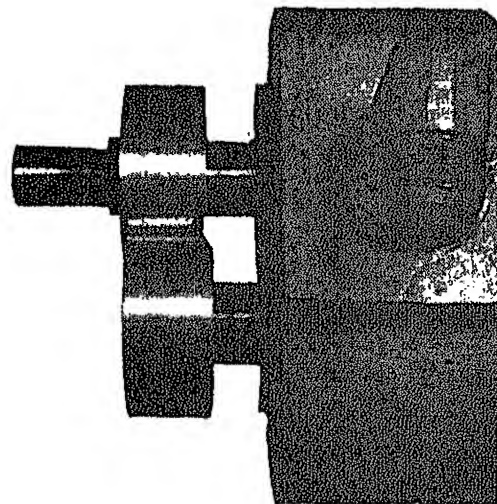
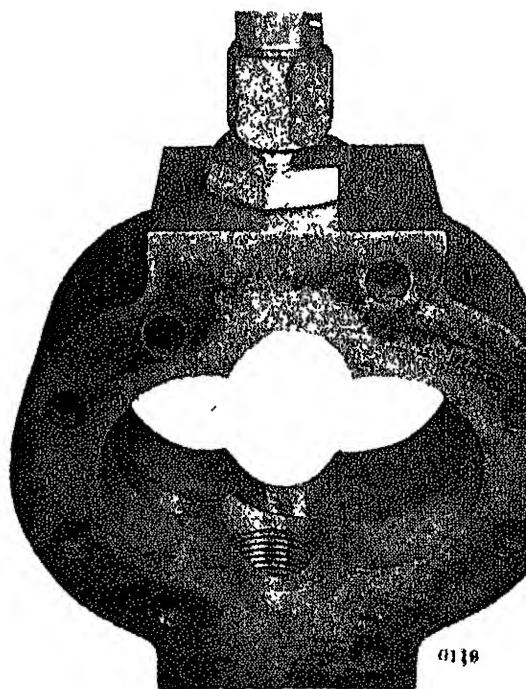


FIGURE 9-85.



SECTION 9 STEERING

a. Clean all parts thoroughly in cleaning solvent.

b. Check gears and shafts for nicks, burrs, cracks or chipping. Discard defective components.

c. Examine gear chamber of body for contact between gears and body, especially the intake cavity of the body. Although wear of more than 1/64 of an inch (0.397 mm) is abnormal, it is not critical if the bearings are not defective. The intake cavity is shown in figure 9-86.

d. Inspect the body and bearing for irregularities of the bore caused by bearing attempting to turn or signs of working. (see figure 9-87).

e. Examine bearings and body for scratches and pitting (see figure 9-88). Use fine sand paper on a surface plate to dress out any slight imperfections of bearings (see figure 9-89). Do not attempt to remove deep scratches or gouges. Check bearing bores for concentricity

(see figure 9-90). Place bearings in respective positions in the body and check clearance between bearing flats. Under all circumstances should these clearances meet specifications (refer to Section 2).

f. Check milled seal and gasket recess in the cover for any obstruction that might prevent normal seating. Make sure threads of front cover and three capscrews are in good condition.

9-59. REASSEMBLY OF STEERING PUMP (see figure 9-91).

a. Apply a light coat of non-hardening gasket cement to the bore in the front cover. Press new shaft seal into the bore and remove excess cement. Stake seal in three places.

NOTE: Generously lubricate all parts with 10 W oil during pump assembly.

b. Install front bearing gears and bearings in their respective positions. Make sure all marks previously made

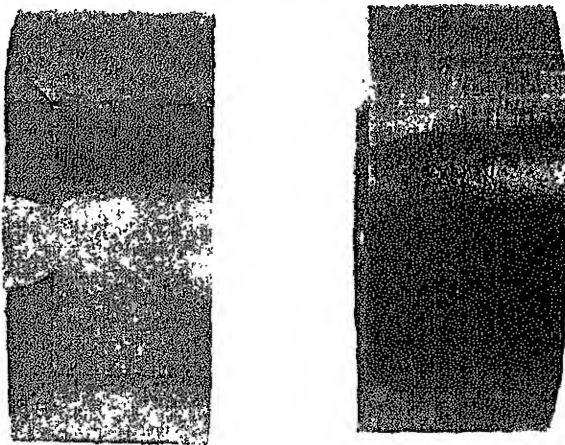


FIGURE 9-87.

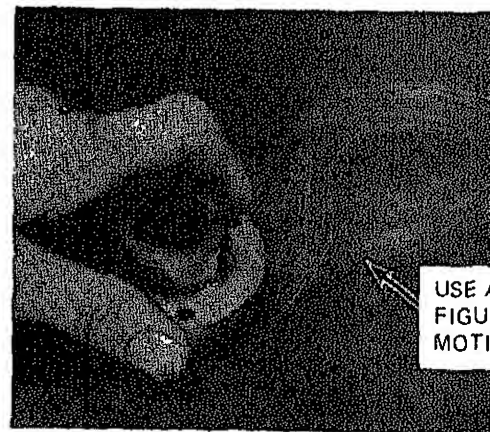


FIGURE 9-89.



gasket seal in front cover recesses.

d. Assemble front and rear cover to body, being careful that the "W" gasket retains its position in the recess of the front cover. Tighten capscrews to specified torque.

CAUTION: The pump rotation is identified by the arrow stamped on the pump body. When assembling the pump, the front cover (drive end of the pump) should be located on the "arrow" end.

9-60. INSTALLATION.

a. Tighten the mounting bolts securely.

b. Make certain all hydraulic fittings are tightened.

c. Bleed the system as specified in paragraph 9-83.

CAUTION: Check for abnormal hot spots. If any particular area is hot, stop the assembly and inspect.

9-61. FLOW DIVIDER (DETROIT DIESEL).

9-62. DESCRIPTION (see figure 9-92).

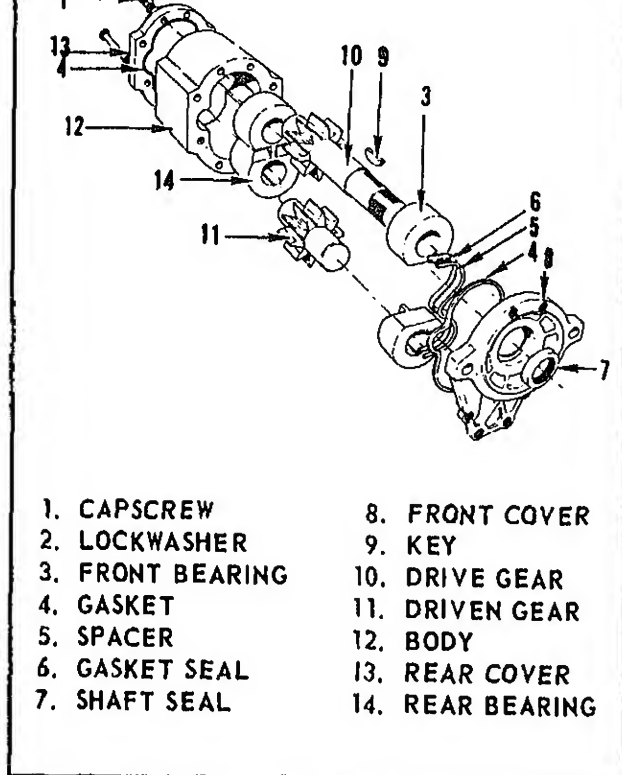


FIGURE 9-91.

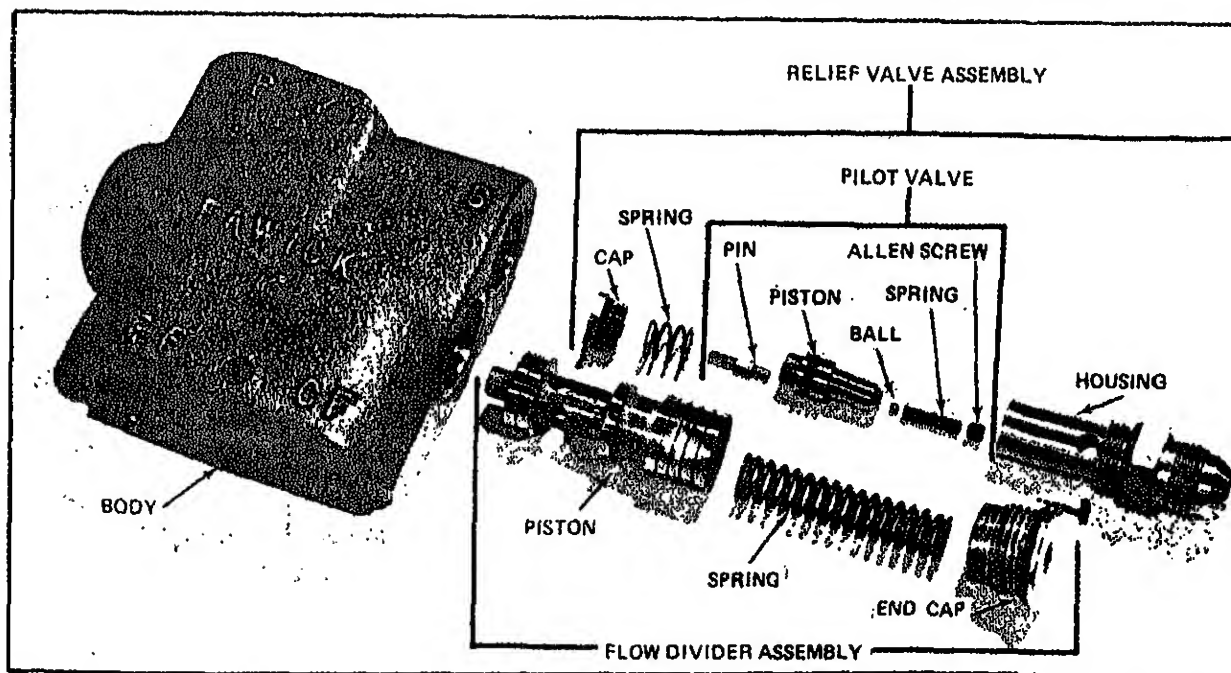


FIGURE 9-92.

right-hand side of the engine compartment. Four hoses are routed to and from the flow divider. The unit consists of a body, a pressure-compensated piston and a pilot operated relief valve.

9-64. Port "P" is for the pump supply hose. Port "CF" is for controlled flow and is connected to the steering control unit at the gooseneck. Port "EF" is for excess flow and is connected to the inlet fitting of the pump. Port "S" is for relief flow and is connected to the outlet fitting in the hydraulic tank.

9-65. OPERATION (see figure 9-92).

9-66. At low pump speed, with input flow equal or less than set controlled flow, all flow is directed to the controlled flow "CF" port. The pressure-compensating pistons prevent or block any flow to the excess flow port. Controlled flow in this situation may be used up to the full integral relief valve pressure, however, the rate of controlled flow will decrease if the input flow decreases.

9-67. When input flow is increased, the pressure-compensated piston, in maintaining a fixed pressure drop across the orifice, moves further away from its stop position to allow fluid to flow from the input port to the excess flow "EF" port in maintaining the set controlled flow.

9-68. The pilot operated relief valve is factory set to 1500 ± 50 PSI (105.5 ± 3.5 kg/cm²) and cannot be adjusted. This valve relieves excessive pressures due to shock loads or other causes.

9-69. REMOVAL OF FLOW DIVIDER (see figure 9-1.)

- a. Remove all hydraulic lines from the flow divider and cap all openings.
- b. Unscrew mounting capscrews and remove flow divider from mounting bracket.

9-70. DISASSEMBLY OF FLOW DIVIDER (see figure 9-92).

CAUTION: The piston end cap is spring loaded.

- a. Remove end cap, spring and piston.

follow these steps:

- (1) Remove the spring loaded end cap and remove the spring and pin.

- (2) Push the piston out of the housing by inserting a small drift into the hose end of the housing. Removal of piston may be difficult because the o-ring has to slide past threads.

9-71. CLEANING AND INSPECTION.

- a. Clean all parts thoroughly.
- b. Check bores and spools for nicks and scratches. Spools must slide freely in their bores.
- c. Ports and orifices must be free of obstructions.

9-72. REASSEMBLY AND INSTALLATION OF FLOW DIVIDER (see figures 9-1 and 9-92).

CAUTION: Replace and oil all o-rings.

- a. Insert the relief piston into the relief valve housing. Insert the pin into the piston (the short side goes into the piston) and the spring. Screw the end cap into relief valve housing.
- b. Screw the relief valve housing assembly into the flow divider.
- c. Install the piston, spring and cap.
- d. Install the mounting capscrews.
- e. Connect the hydraulic lines.

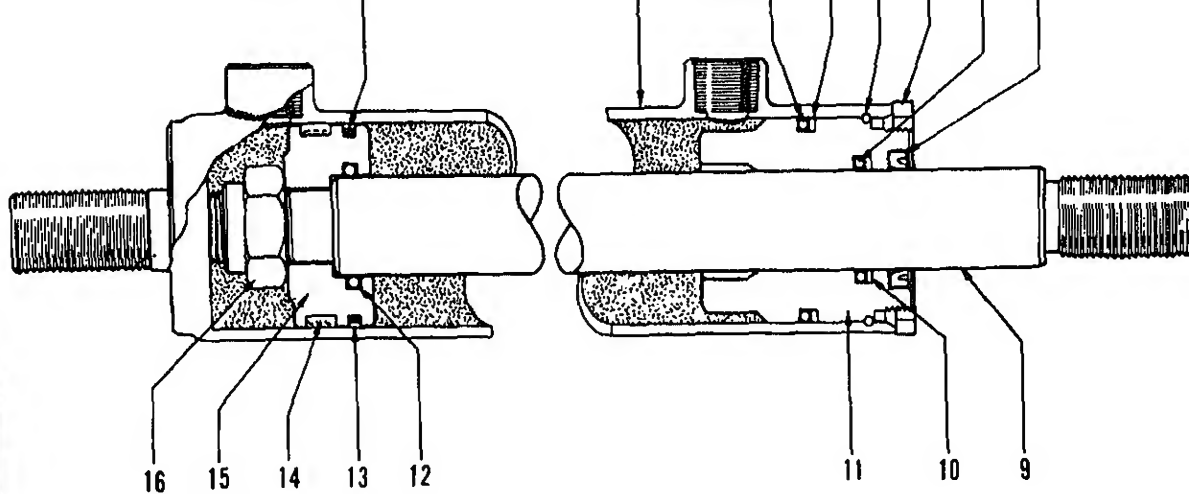
9-73. ADJUSTMENT OF FLOW DIVIDER RELIEF VALVE.

9-74. The relief valve is factory set at 1500 ± 50 PSI (105.5 ± 3.5 kg/cm²). Do not try to adjust or repair the relief valve, but replace the whole valve.

9-75. STEERING CYLINDER.

9-76. DESCRIPTION (see figure 9-93).

9-77. The steering cylinder is a double-acting cylinder consisting primarily of a shell, piston and rod assembly and two end plugs. Hydraulic oil applied to one of the cylinder



1. BACK-UP RING
2. SHELL
3. O-RING
4. BACK-UP RING

5. LOCK RING
6. NUT
7. BACK-UP RING
8. WIPER SEAL

9. ROD
10. BACK-UP RING
11. RETAINER
12. O-RING

13. PISTON RING
14. WEAR RING
15. PISTON
16. LOCK NUT

FIGURE 9-93.

and rod movement. As one side of the cylinder fills, the opposite side is dumping an equal amount of oil. Oil is prevented from internally transferring from one side of the piston to the other by a teflon seal ring. The cylinder completes its stroke when the piston reaches a retainer. At this time, hydraulic pressure increases, causing the system relief valve to open. This prevents excessive pressure buildup in the system.

NOTE: For straight-ahead travel, the piston is positioned in the center of the cylinder shell.

9-78. REMOVAL OF STEERING CYLINDER (see figure 9-94).

a. Disconnect the hydraulic lines from the cylinder and plug or cap to keep out dirt and reduce oil loss.

b. Remove the cotter pin from the trunnion end of the cylinder and remove the plug and ball seat.

c. Remove dirt boot by straightening the connector straps.

stud.

e. Disconnect the shell end of the cylinder following steps b through d above.

f. Lift off cylinder and drain.

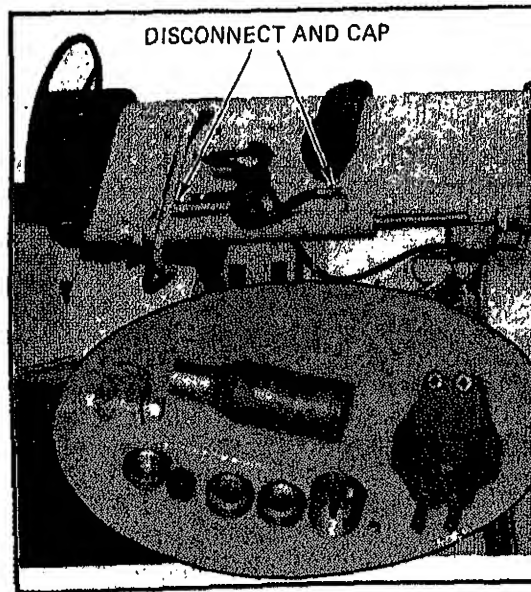


FIGURE 9-94.

b. Unscrew and remove the retainer.

c. Using a section of hollow round stock, push the retainer into the cylinder shell until the snap ring can be easily removed from the shell.

d. Remove snap ring.

e. Pull sharply on rod to remove retainer, piston and rod.

f. Clamp rod in a vise between two pieces of clean, soft wood. Remove piston jam nut.

g. Tape rod threads and remove piston.

h. Remove the wear ring from piston if damaged, scored or chipped.

i. Remove the teflon piston ring and o-ring.

j. Remove the inner o-ring from the piston.

k. Remove retainer from the cylinder rod and remove the outer and inner o-rings and back-up rings.

l. Remove wiper seal from the end of the retainer.

9-80. CLEANING AND INSPECTION.

a. Wash all parts in solvent and inspect for nicks, burrs, and scratches. Dress parts with fine sandpaper or India stone if necessary.

b. Check all contact surfaces for any abnormalities and piston rings for wear. Replace if necessary.

9-81. REASSEMBLY OF STEERING CYLINDER (see figure 9-93).

NOTE: All o-rings and wipers should be replaced on reassembly.

a. Install outer and inner o-rings and backup rings and wiper seal in the retainer.

b. Lubricate the rod and the entire retainer with "Hyster Approved" Packing Lubrication. Carefully install the retainer on the rod.

e. Lubricate the piston with "Hyster Approved" Packing Lubricant and install piston on the rod.

f. Remove tape and install jam nut per specification.

g. Compress wear ring and piston fingers and insert into the cylinder shell.

h. Push the rod and the retainer into the shell until the snap ring can be installed. Install snap ring.

i. Pull sharply on the rod until the bottoms against the snap ring.

j. Install the nut on the retainer. Torque per specification.

k. Install rod end ball joint.

l. Lubricate the five rod end ball joint internal parts which include the spring, spring, both ball stud seats and threaded plug (refer to Section 4).

9-82. INSTALLATION OF STEERING CYLINDER (see figure 9-94).

a. Install the spring seat, spring and ball stud seat in the shell end of the cylinder and position the cylinder on the grommet mounted ball stud.

b. Install the remaining ball stud threaded plug. Tighten plug until the plug will hold its position horizontal to the cylinder without assistance.

c. Tighten plug until the cotter pin can be installed. Install cotter pin.

d. Connect hydraulic hoses to the cylinder.

e. Position the rod end ball stud joint on the trunnion arm mounted ball stud. Install the remaining ball stud seat the threaded plug.

f. Tighten plug until all the spring tension in the ball joint is taken up. Tighten plug until the cotter pin can be installed. Install cotter pin.

g. Fold back the seal, and secure their position with the metal ribbons.

figure 9-95).

9-83. BLEEDING THE SYSTEM.

9-84. Air may become trapped in the system if any hoses or components are removed. An aerated system is indicated by jerky or spongy operation when the steering wheel is turned.

9-85. All hydraulic hoses leading to and from the cylinder enter at the top of the cylinder. Therefore, the system can be bled without disconnecting the hoses. Bleed the system as follows:

a. Fill the hydraulic tank with the specified oil (refer to Section 4).

b. Start the engine and allow to idle at 500 to 600 RPM for approximately one minute. This allows large air bubbles in the system to escape.

WARNING: Do not extend the hands or arm through the center of the steering wheel. If the steering control unit has been disassembled and incorrectly timed, the wheel may suddenly become motorized or rotate abruptly with extreme force. If this occurs, see figure 9-2 and paragraph 9-27, step t and retime the control unit as shown.

c. Increase engine speed to approximately 1,000 RPM and rotate the steering wheel as fast as possible in either direction. This should produce enough compression of oil to force the air out of the lines.

d. Continue to rotate the wheel in the same direction until the guide roll reaches its limit. Quickly reverse the steering wheel rotation to pressurize the opposite end of the steering cylinder.

e. Continue to rotate the wheel left and right, from stop to stop, until steering control is normal.

NOTE: If steering control fails to return to normal, air may be entering the system at the suction side of the pump (see figure 9-82). Check and tighten all hose fittings securely. Also check system pressure as specified in paragraph 9-86.

9-87. Pressure can be checked at the base of the steering cylinder fitting. Use a gauge at 3000 PSI (200 kg/cm²) or greater. Temperature should be approximately 100°F (37° C). To check pump output pressure, proceed as follows:

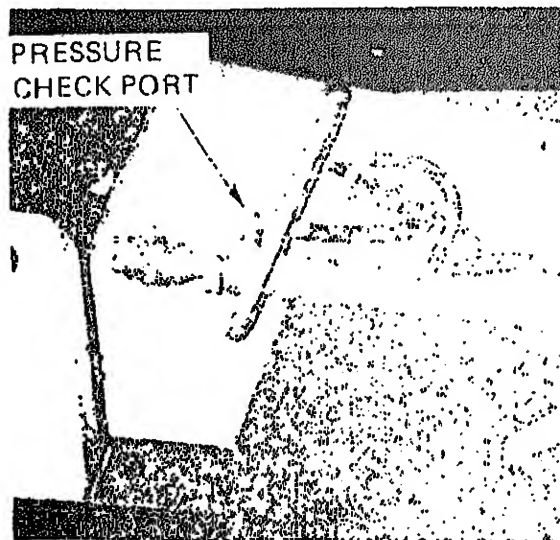


FIGURE 9-95.

a. Remove the plug at the steering cylinder base inlet fitting.

b. Connect pressure gauge to the cylinder fitting.

c. Start the engine and set speed at idle. Rotate steering wheel from stop to stop. As guide rolls reach stops, the pressure should indicate relief pressure (refer to Section 2).

CAUTION: Do not hold system over relief pressure longer than 20 seconds. This can damage the pump.

NOTE: If proper pressure is not obtained, remove the relief valve and clean the parts thoroughly. Carefully check the relief valve spool for burrs. Install

valve and recheck the pressure. If proper pressure cannot be obtained, replace the relief valve assembly. If pressure remains low, disassemble the pump and inspect all parts for damage and wear.

9-88. STEERING TRUNNION ASSEMBLY.

9-89. DESCRIPTION (see figure 9-96).

9-90. The Steering Trunnion Assembly consists primarily of a king pin assembly, oscillation pin assembly, steering yoke, axle assembly, and two guide rolls. The unit gooseneck frame rests on the trunnion assembly. Two guide rolls are used to prevent scuffing of material during turns. The oscillation pin assembly allows the steering yoke to adjust to differences in ground levels preventing bridging between the drive drum and guide rolls.

9-91. REMOVAL OF GUIDE ROLLS AND STEERING AXLE ASSEMBLY.

9-92. The method of removing the axle shaft assembly depends upon the availability of the equipment. An overhead crane or a lift truck

can be used to lift the front end of the guide rolls and steering axle assembly and be removed.

a. Remove front scraper assembly in position guide roll rear scraper assembly in position (see figure 9-97).

WARNING: The scraper bar may be

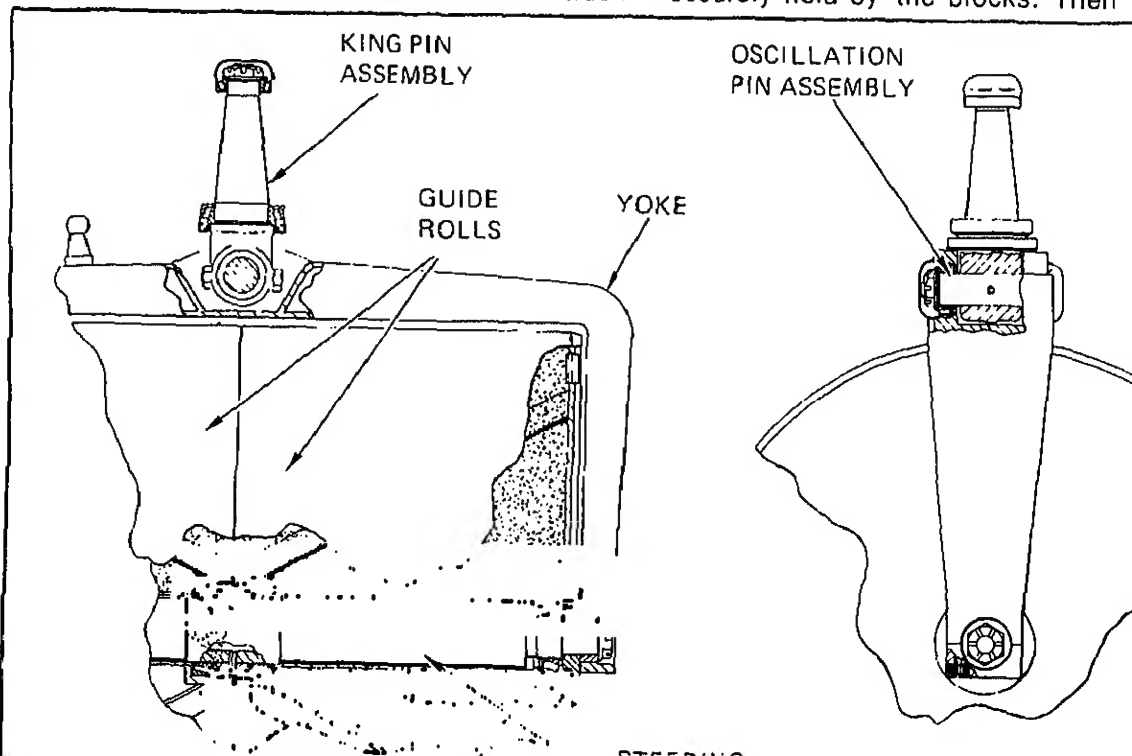
b. Remove the capscrews (four) steering yoke caps. Then remove caps (see figure 9-98).

NOTE: Yoke caps are matched and assembled to the same side from which they were removed.

WARNING: Be sure drive drum is blocked.

c. Lift the gooseneck up until the shaft will clear the steering yoke. Clear the guide roll ahead. Block up the frame (see figure 9-99).

d. Lower the gooseneck until the steering yoke is securely held by the blocks. Then



9-98. DISASSEMBLY OF AXLE SHAFT ASSEMBLY (see figure 9-101).

NOTE: Remove axle shaft assembly from unit by following procedure outlined in paragraph 9-91. Then position axle shaft assembly on a hard level surface.

- a. Remove cotter pin, slotted nut, and thrust washer from one side.
- b. Remove split spacers and solid spacer. Tag for reassembly into same position.
- c. Slightly lift the drum (with components removed) and slide the drum off of the axle.

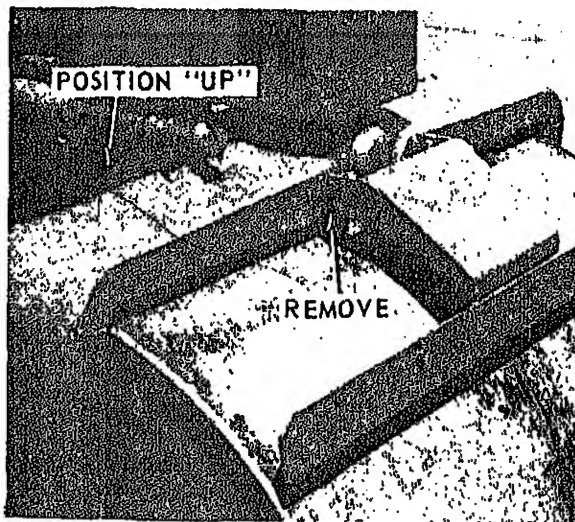


FIGURE 9-97.

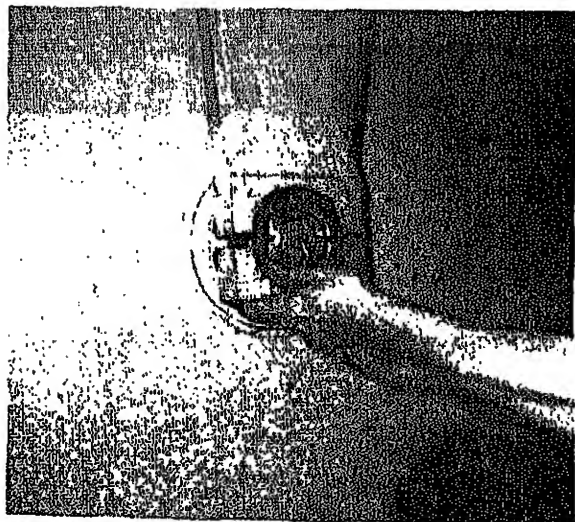


FIGURE 9-98.

e. Remove seals, bearings, shim(s), and center spacer from axle shaft.

CAUTION: Tag bearings and shim(s) for reassembly into same position.

f. Clean and inspect components per paragraph 9-94.

9-94. CLEANING AND INSPECTION.

a. Clean all parts in solvent or other suitable cleaning agent. Dry thoroughly with compressed air or clean lint-free cloth. If parts are not to be assembled immediately, coat machined surfaces with clean oil and cover.

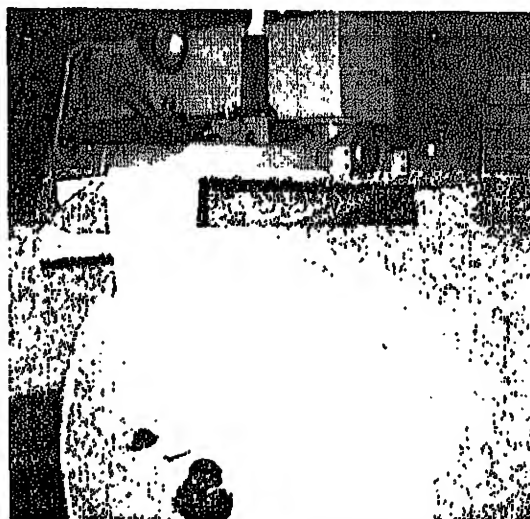


FIGURE 9-99.

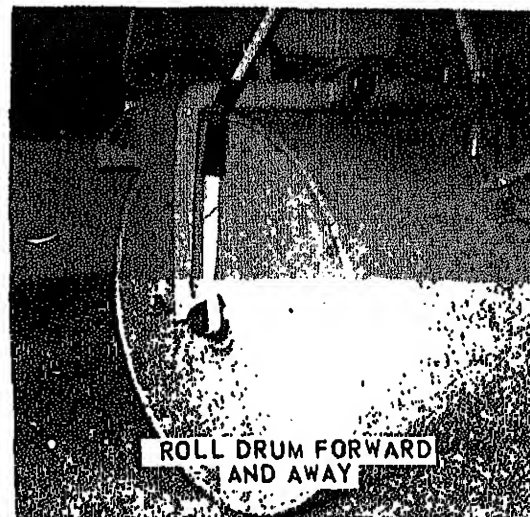


FIGURE 9-100.

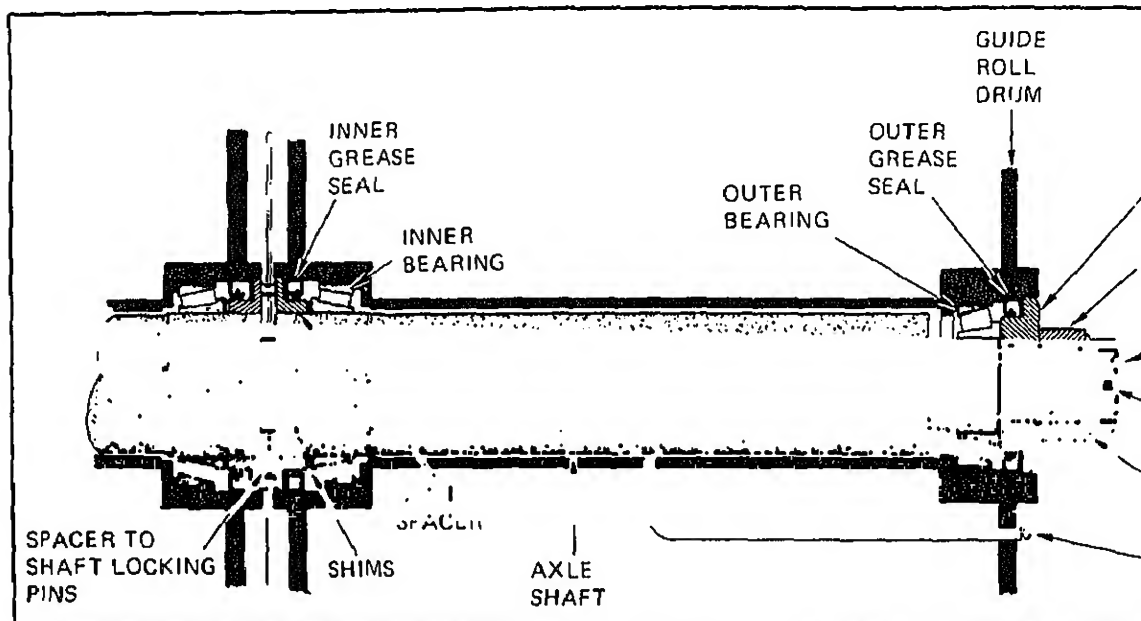


FIGURE 9-101.

b. Inspect all seals. Replace any seals that are cut, worn or otherwise have a doubtful remaining service life.

c. Inspect all bearings for cracks, nicks, galling, brinelling, etc. Replace all parts that are defective or have a doubtful remaining service life.

d. Check bearing surfaces for evidence of bearings turning on the shaft. If bearing inner race is turning, check concentricity of the shaft. Repair or replace if found to be eccentric or badly worn. Slight imperfections of the shaft may be removed with fine sandpaper. Check the roller bearing surfaces of the shaft for nicks, galling and cracks. Repair or replace shaft if any of these are found or if a definite step can be felt between the worn and unworn surfaces when checked with fingernail.

e. Clean the shaft cavity of the drums with solvent and dry thoroughly.

9-95. REASSEMBLY OF AXLE SHAFT ASSEMBLY.

a. Lubricate all bearing cup bores (four), then install bearing cups (one inner and outer

c. Insert center spacer on shaft locking pins (see figure 9-104).

d. Install shim(s) in original location (see step e, paragraph 9-101). Insert shaft into one drum, then insert the other drum on the other side of the shaft assembly (see figure 9-105).

e. Install outer bearing, grease seal, and outer solid spacer into each drum (see figure 9-106).

f. Install split spacers, thrust washers, and slotted nuts (see figure 9-107).

g. Working at each end separately, tighten each slotted nut to 200 ft.-lbs. (27.7 kg-m), then retighten to 25 ft.-lbs. (3.5 kg-m), then retighten to 25 ft.-lbs. (6.3 kg-m) or next higher cotter pin (see figure 9-108).

NOTE: Ensure that the drums are on a level surface. Placing one drum on a pallet and the other drum on a lift truck or hand dolly will make the drums to easily assemble.

h. Check to see if clearance between

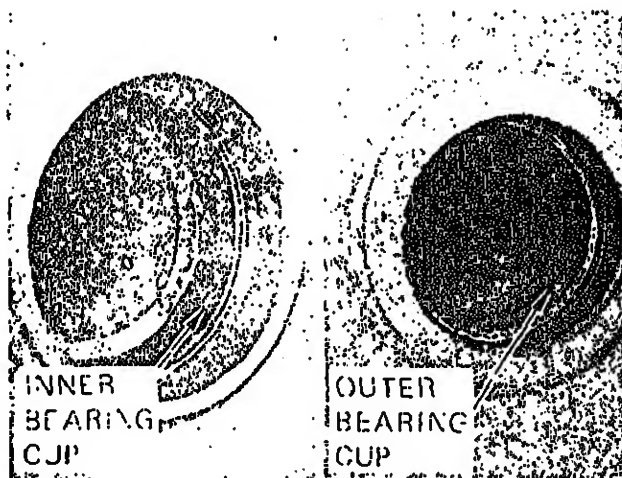


FIGURE 9-102.

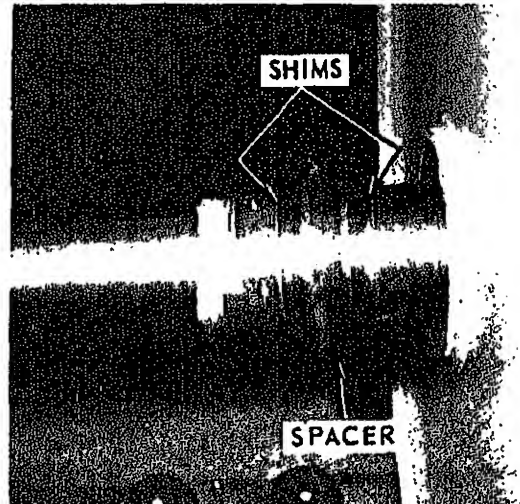


FIGURE 9-105.

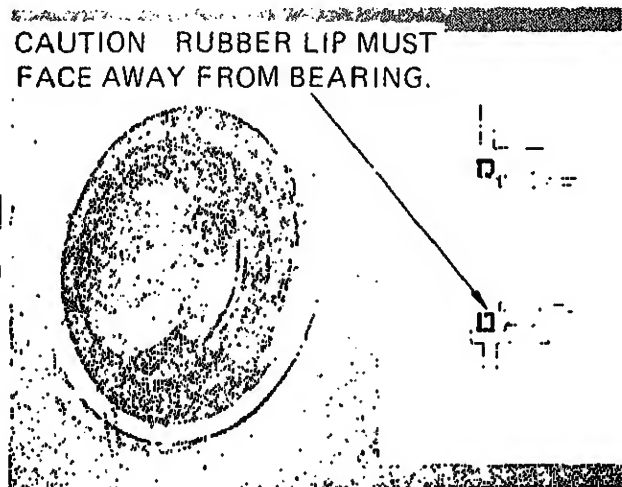


FIGURE 9-103.

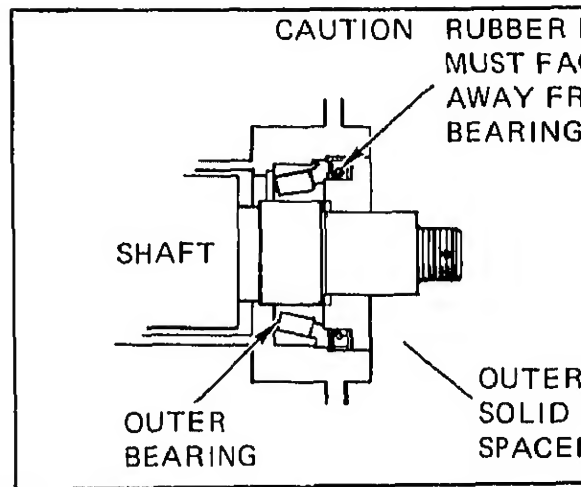
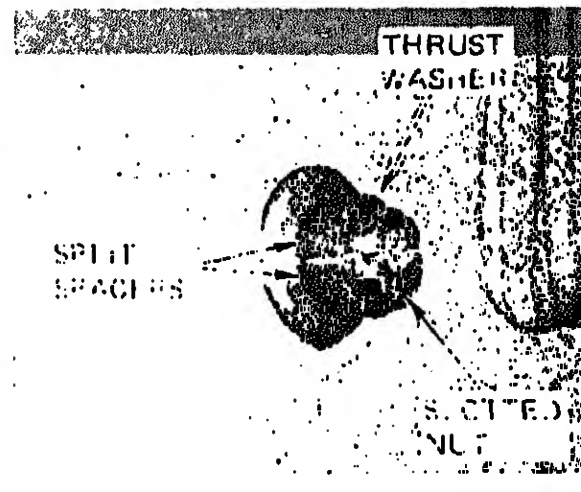
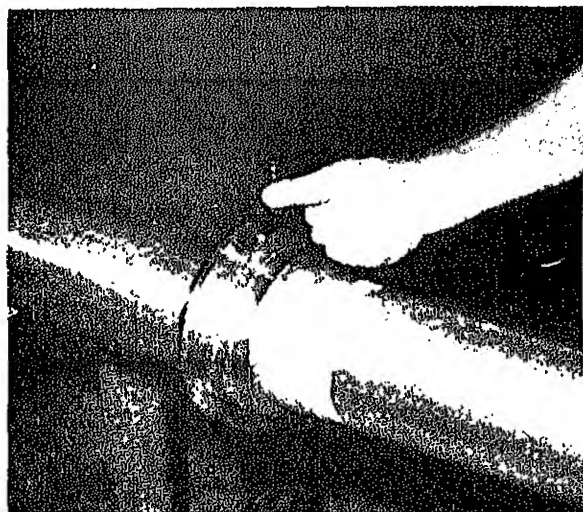


FIGURE 9-106.



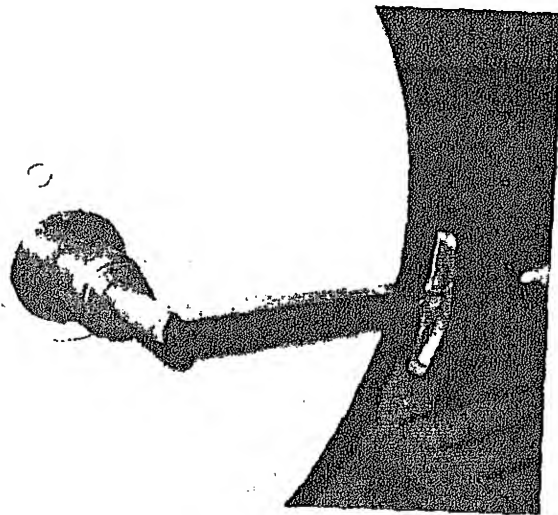


FIGURE 9-108.

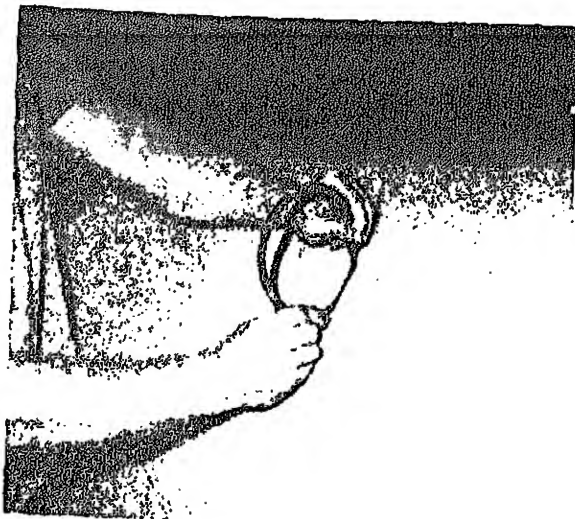
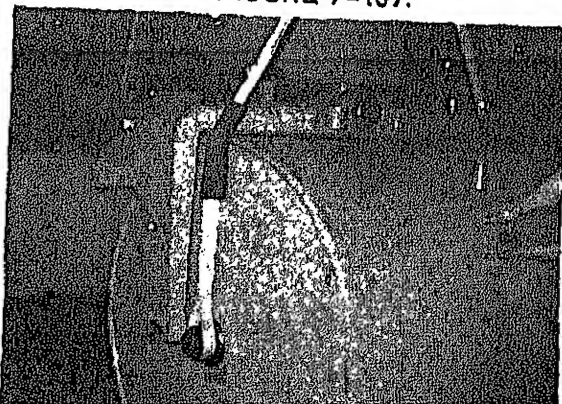


FIGURE 9-109.



9-96. INSTALLATION OF GUIDE ROLLERS ON STEERING AXLE ASSEMBLY

a. Lift axle shaft assembly so it is in the position of the steering yoke (see figure 9-108).

b. Lift the gooseneck up until the steering yoke clears the axle shaft space. Then carefully roll the guide rollers until they are directly over the axle shaft (see figure 9-109).

c. Position the spacer slits so they are in line with the slits between the caps on the steering yoke. Remove the frame bracket. Then lower the gooseneck until the axle shaft is in the weight (see figure 9-112).

d. Install each cap on the original position. Be sure groove (1) is to the outside (see figure 9-113).

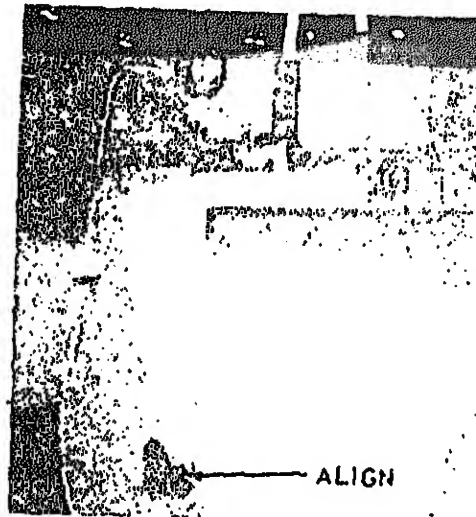
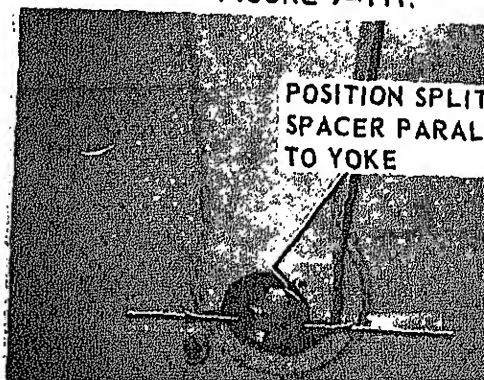


FIGURE 9-111.



POSITION SPLIT SPACER PARALLEL TO YOKE

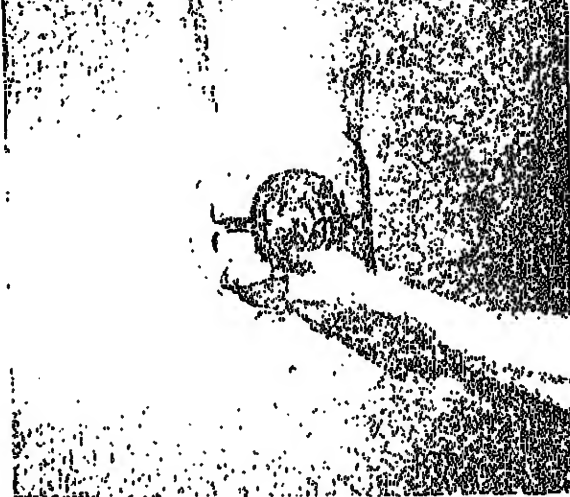


FIGURE 9-113.

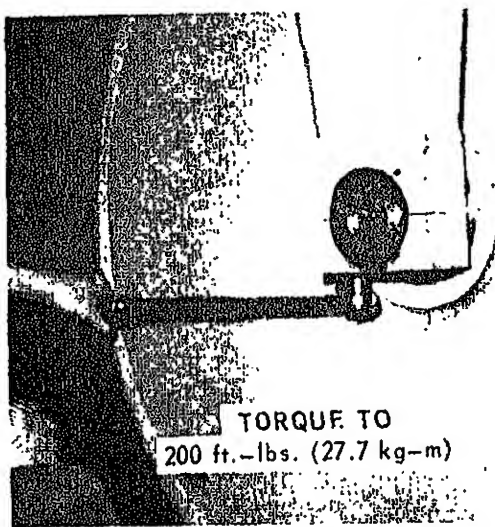
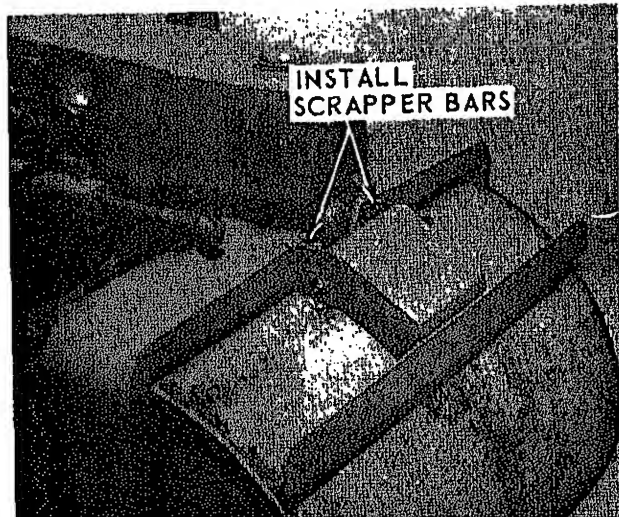


FIGURE 9-114.



(see figure 9-114).

f. Install the front scraper bar. Lubricate axle shaft assembly (refer to Section 4) figure 9-115.

9-97. REMOVAL AND DISASSEMBLY OF AND KING PIN ASSEMBLY.

NOTE: Remove axle shaft assembly from by following procedures outline paragraph 9-91. Then proceed follows:

a. Remove scraper bar and coco assembly, water spray manifold and disconnect steering cylinder ball joint assembly (see 9-116).

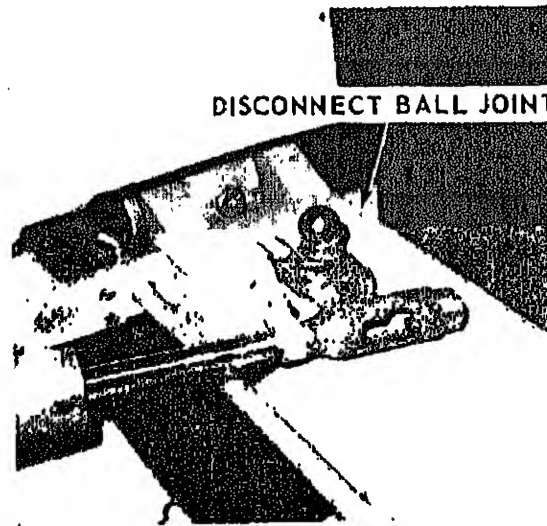
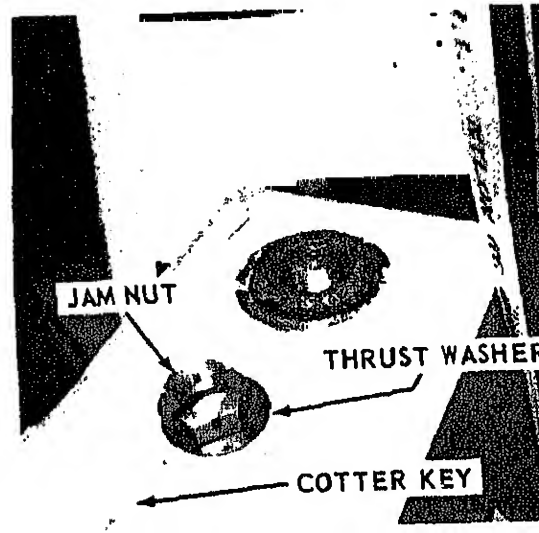


FIGURE 9-116.



SECTION 9 STEERING

b. Support yoke with a hoist or lift truck. Then remove king pin dust cover, cotter pin, jam nut, and thrust washer (see figure 9-117).

WARNING: Be sure unit is securely blocked.

c. Lower yoke assembly onto the floor, then remove both king pin bearings and the seal. Tag bearings for reassembly with its respective cup. Inspect bearings and replace both king pin bearing assemblies if any one of the bearing components is damaged (see figure 9-118).

d. Remove oscillation pin dust covers, cotter keys, jam nuts, and thrust washers, then remove locking bolt (see figure 9-119).

e. Remove oscillation pin and bearings. Tag

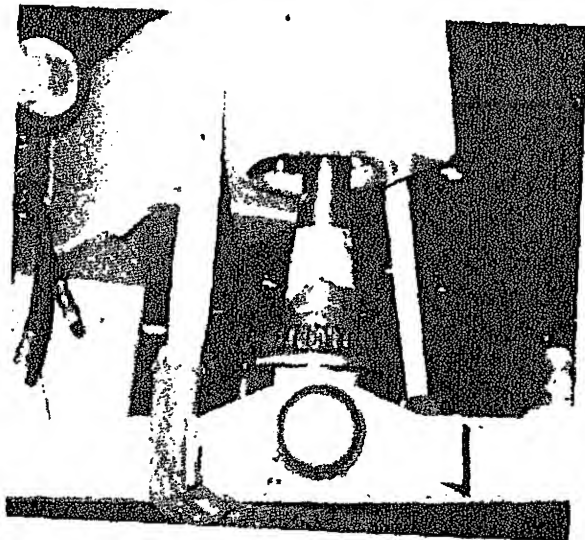
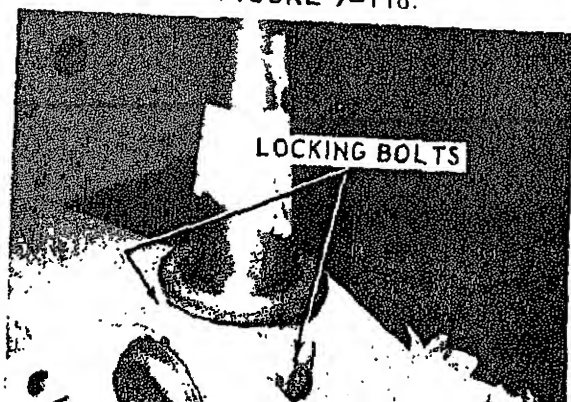


FIGURE 9-118.



bearings for reassembly with its cup. Inspect bearings and replace bearings if any one of the bearing components is damaged (see figure 9-120).

NOTE: Mark king pin and oscillation pin seals and bearings so they may be installed at the same attitude with respect to the

f. Lift out the king pin. Remove oscillation pin seals and bearings. Thoroughly clean the bores and bearings for damage (see figure 9-121).

9-98. CLEANING AND INSPECTION

a. Clean all parts in solvent or other cleaning agent. Dry thoroughly with compressed air or clean lint-free cloth. If parts



FIGURE 9-120.



to be assembled immediately, coat all machined surfaces with clean oil and cover.

b. Inspect all seals. Replace all seals that are cut, worn or otherwise have a doubtful remaining service life.

c. Inspect all bearings for cracks, nicks, galling, brinelling, etc. Replace all parts that are defective or have a doubtful remaining service life.

d. Check bearing surfaces for evidence of bearings turning on the shaft. If bearing inner race is turning, check concentricity of the shaft. Repair or replace if found to be eccentric or badly worn. Slight imperfections of the shaft may be removed with fine sandpaper. Check the roller bearing surfaces of the shaft for nicks, galling and cracks. Repair or replace

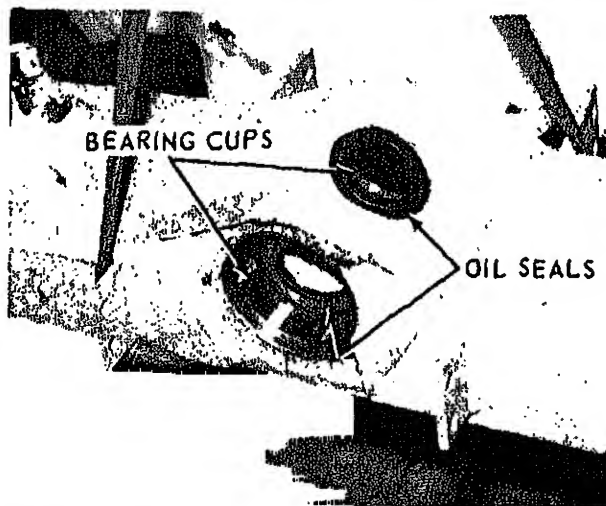
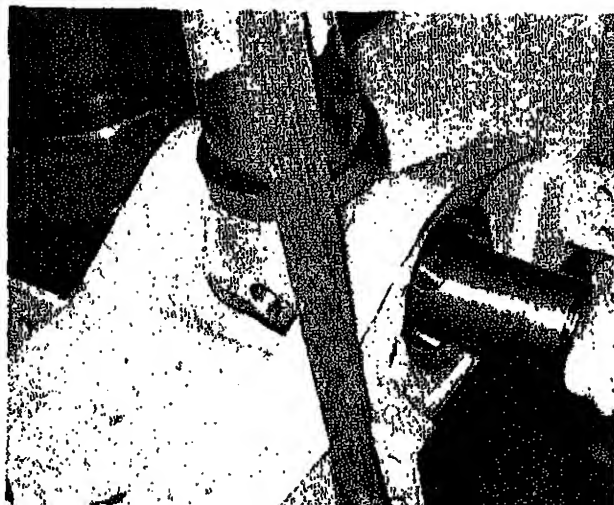


FIGURE 9-122.



shaft if any of these are found or if a definite step can be felt between the worn or unlubricated surfaces when checked with fingernail.

e. Clean the inside of the gooseneck solvent and dry thoroughly.

9-99. REASSEMBLY AND INSTALLATION OF YOE AND KING PIN ASSEMBLY.

a. Install bearing cups into gooseneck housing if removed during disassembly (see figure 9-122).

b. Pack bearing cones with Hyster Approved multipurpose grease.

c. Install bearing cone and oil seal into gooseneck (see figure 9-122).

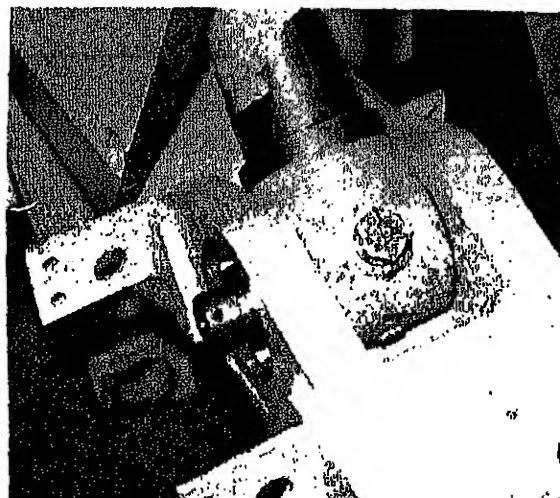
d. Insert king pin into gooseneck and housing with Hyster approved multipurpose grease.

e. Install upper bearing cone washer and slotted nut (see figure 9-123).

f. Install bearing cups into yoke (see figure 9-124).

g. Insert oscillation pin into yoke and housing. Install two locking bolts into oscillation pin and torque to 200 ft.-lbs. (27.7 kg-m). (see figure 9-125).

h. Pack bearing cones with Hyster approved multipurpose grease and install two (2) washers and slotted nut on each end of the oscillation



pin (see Figure 9-125). Tighten nut equally so that king pin remains centered on yoke. Torque one slotted nut to 200 ft.-lbs. (27.7 kg-m) lubed then back off to loose and retorque to 75 ft.-lbs. (10.4 kg-m). Check torque on opposite slotted nut. It should be 75 ft.-lbs. (10.4 kg-m).

NOTE: Check that running clearance exists on both sides of king pin. Adjust if necessary by repeating step h.

i. Install cotter keys into slotted nuts on both ends of the oscillation pin. Fill dust caps half full with Hyster approved multipurpose grease and install.

j. Install guide roll assembly (refer to paragraph 9-96).

k. Place unit on ground so that entire weight of gooseneck rests on king pin. Torque slotted nut to 200 ft.-lbs. (27.7 kg-m) lubed. Back off to loose and retorque to 75 ft.-lbs. (10.4 kg-m).

l. Install cotter key and fill dust cap half full with Hyster approved multipurpose grease and install.



FIGURE 9-125.

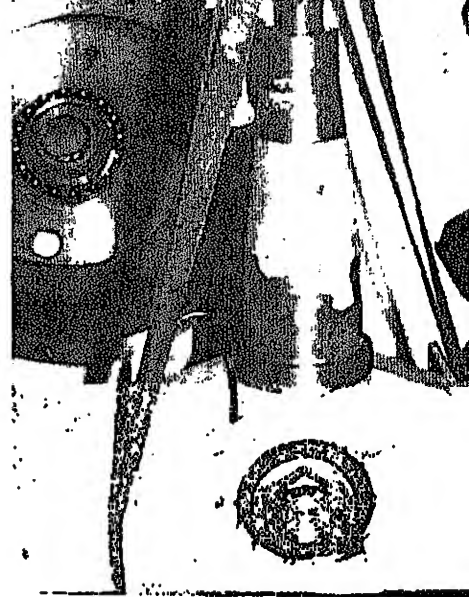


FIGURE 9-126A.



FIGURE 9-126B.

tion of the park brake assembly.

10-3. Design specifications are given in Section 2. Maintenance requirements are discussed in Section 4. Troubleshooting instructions are given in Section 5.

10-4. DESCRIPTION.

10-5. The parking brake is a mechanically operated friction brake mechanism that prevents the final drive from rotating. The braking

brake drum. The brake drum is splined to final drive shaft.

10-6. REMOVAL AND DISASSEMBLY (figure 10-1).

10-7. Block guide roll and drive drums prior removal of the the brake drum assembly prevent movement of the unit. Set the park brake handlever to the brake applied position. Remove parking brake access cover located the rear of the left-hand frame channel.

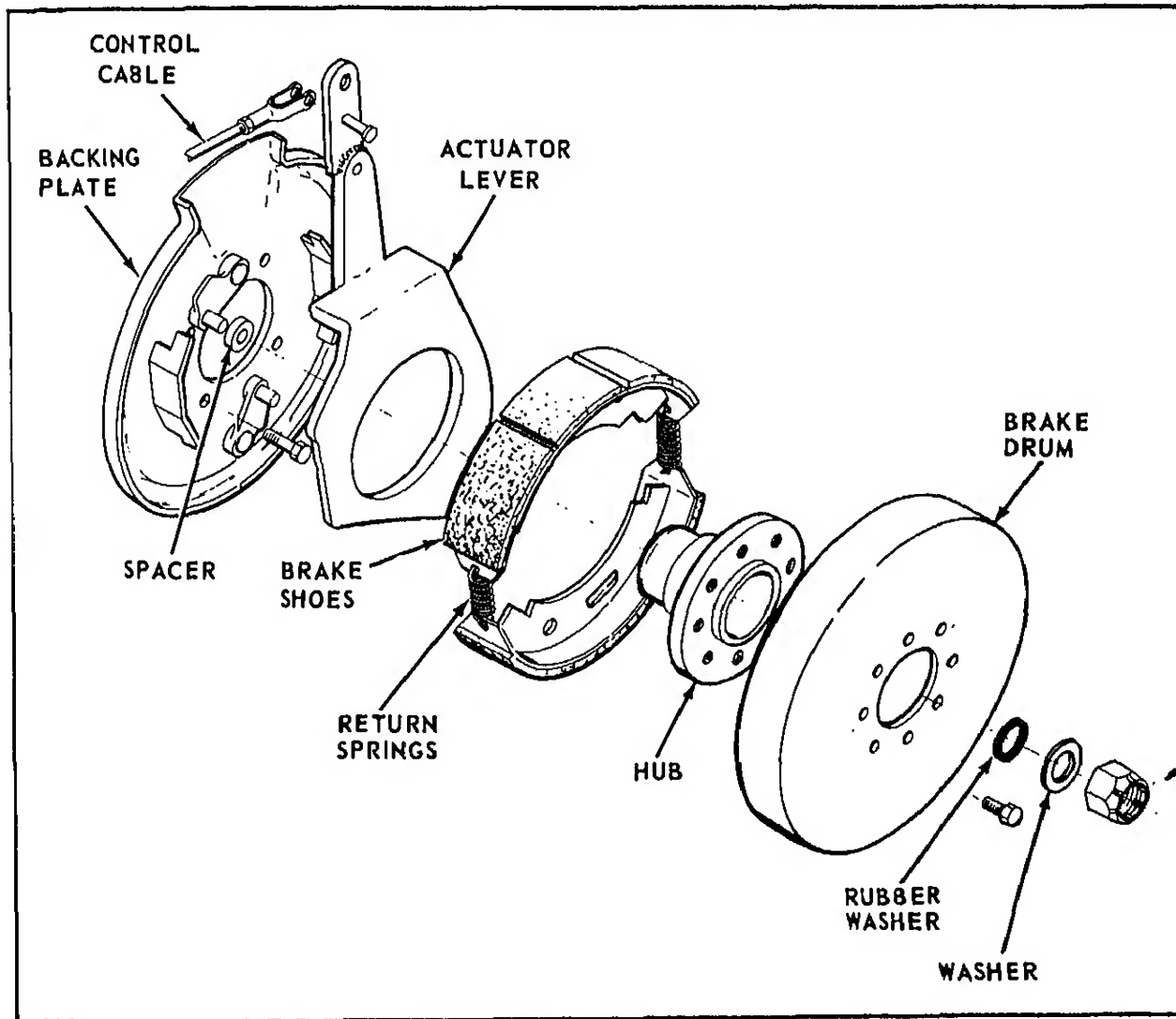


FIGURE 10-1.

a. Remove the brake drum capscrews, then release the parking brake control lever. Remove the brake drum.

b. Remove the brake shaft cotter pin, then remove slotted nut. Remove hub and spacer.

c. Disconnect and remove the brake return springs. Remove brake shoes.

d. Lift out the brake shoe actuator lever and disconnect the control cable.

e. Remove backing plate capscrews, then remove the backing plate.

10-8. CLEANING AND INSPECTION.

a. Use solvent to clean all metal parts except the brake shoe assemblies. The shoe rib and fable can be wiped with a solvent dampened cloth. No solvent should get on the lining.

b. Examine drum for cracks, heat checks and deep grooves. The drums should not be bell-mouthed or barrel-shaped, nor should the mounting holes be elongated. If any of these conditions exist, the drum should be replaced. Glaze on the drum, which is otherwise in good condition, can be removed with coarse sandpaper.

c. The brake shoe linings should be replaced if worn to within 1/15 inch (1.69 mm) or if bonding agent is falling. Do not attempt to save lining soaked with oil or with deep scores.

d. Check springs and discard them if broken, rusted, twisted, nicked or appear fatigued.

10-9. REASSEMBLY AND INSTALLATION.

CAUTION: Use only Hyster Approved replacement parts.

a. Install backing plate with actuator lever depression in position shown (see figure 10-2).

b. Install backing plate capscrews and torque to 49 ft.-lbs. (6.8 kg-m). Then install rollers on both actuator cranks (see figure 10-3).

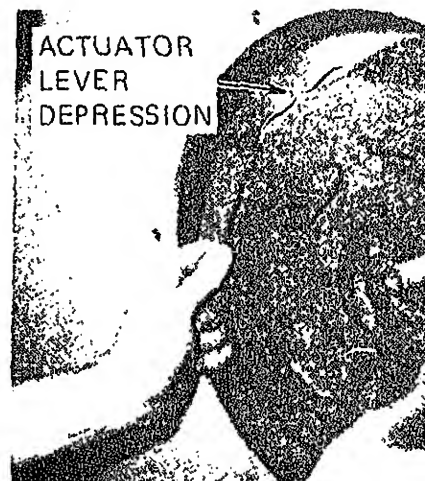


FIGURE 10-2.



FIGURE 10-3.



g. Next Install brake hub, rubber seal, washer and slotted nut (see figure 10-5). Tighten slotted nut to remove end play. Back off one (1) flat (.012 in. - .305 mm loose). **DO NOT EXCEED 26 FT.-LBS. TORQUE.** Secure with cotter pin

e. Install brake shoes and return springs in position shown (see figure 10-6).

f. Install brake drum and torque capscrews to 49 ft.-lbs. (6.8 kg-m) (see figure 10-7).

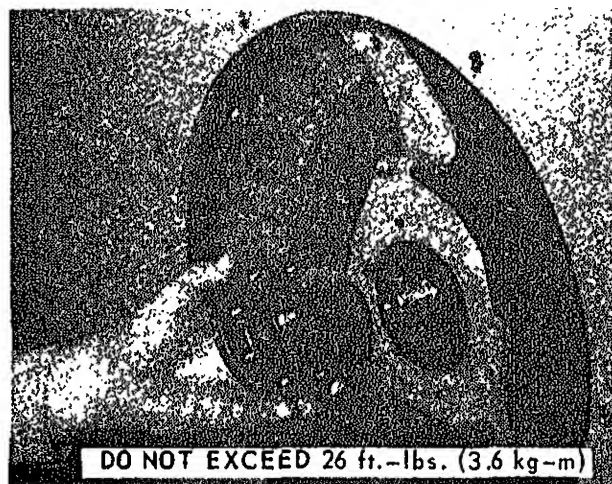


FIGURE 10-5.

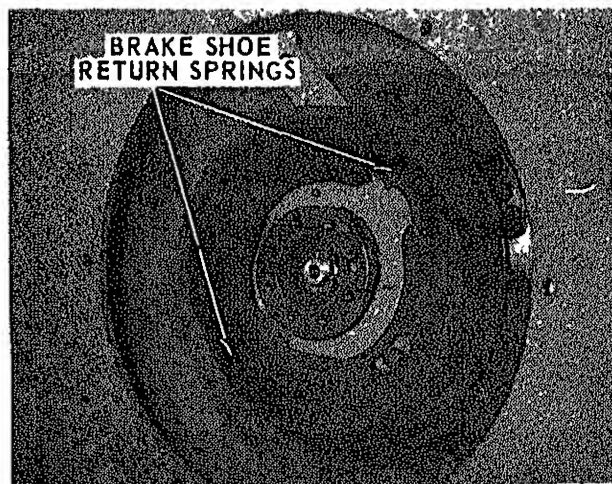


FIGURE 10-6



FIGURE 10-7.

10-10. ADJUSTMENT (see figure 10-8).

10-11. The parking brake handlever should be adjusted sufficiently to require at least 36.3 pounds (16.5 kg) to pull it into the apply position. Turn the adjusting knob on the handlever clockwise (lever in brake-off position) to increase force required to apply the brake.

10-12. Whenever the brake lining wears to a point where the brake cannot be adjusted by the handlever adjusting knob or when a new lining is installed because of wear, an adjustment must be made. This adjustment is made in the linkage on the actuator lever of the brake cable.

a. Disconnect the brake cable from the actuator lever and loosen the cable end joint on the cable.

b. Push the actuator lever arm until the brake shoes contact the brake drum. Adjust the cable end until it aligns with the actuator lever in the shoe contact position.

c. Connect the cable to the actuator lever and adjust the handlever to obtain maximum braking power.

10-13. BRAKE LINING BREAK-IN PROCEDURE

CAUTION: Break-in is essential to obtain adequate braking of the unit.

a. Jack the drive roll off the ground.

b. Warm up unit (Hydraulic oil temperature

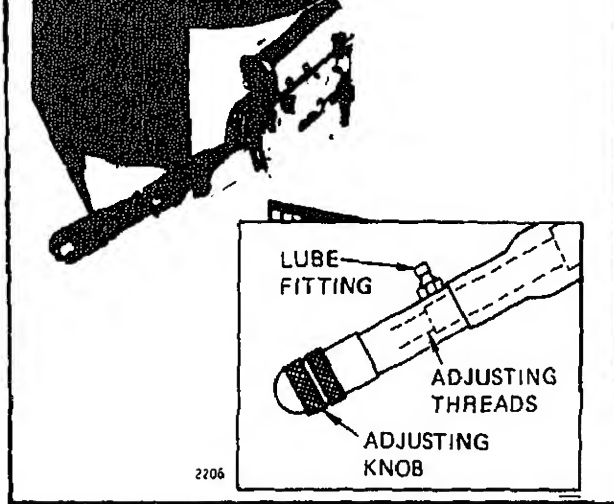


FIGURE 10-8.

c. Adjust brake handle to 40 lb. (18.2 kg) pull.

d. (1) Using full throttle, gradually pull brake handle "on" until transmission is almost stall and hold for 5 seconds. (2) Release brake handle for 60 seconds and then repeat steps (1) and (2) 20 times.

e. Adjust brake handle to 80 lbs. (36.3 kg) minimum pull.

11-2. This section contains the water spray system description, checks, adjustment and service repair information. Refer to Section 2 for Water Spray System Specifications. Hyster-Care Maintenance Instructions are contained in Section 4 and a troubleshooting guide is presented in Section 5.

11-3. DESCRIPTION. (see figure 11-1).

11-4. The Water Spray System consists of a water tank, inlet screen, sump filter, water pump and motor, spray manifolds (bars), associated lines and fittings, electrical switch and a circuit breaker. Refer to Section 6 for electrical schematic. The water pump is centrifugal type pump. The pump is mounted in a cavity recessed into the bottom of the water tank and accessible from under right-hand side of unit.

11-5. The Water Spray System is activated when the operator turns the water spray switch

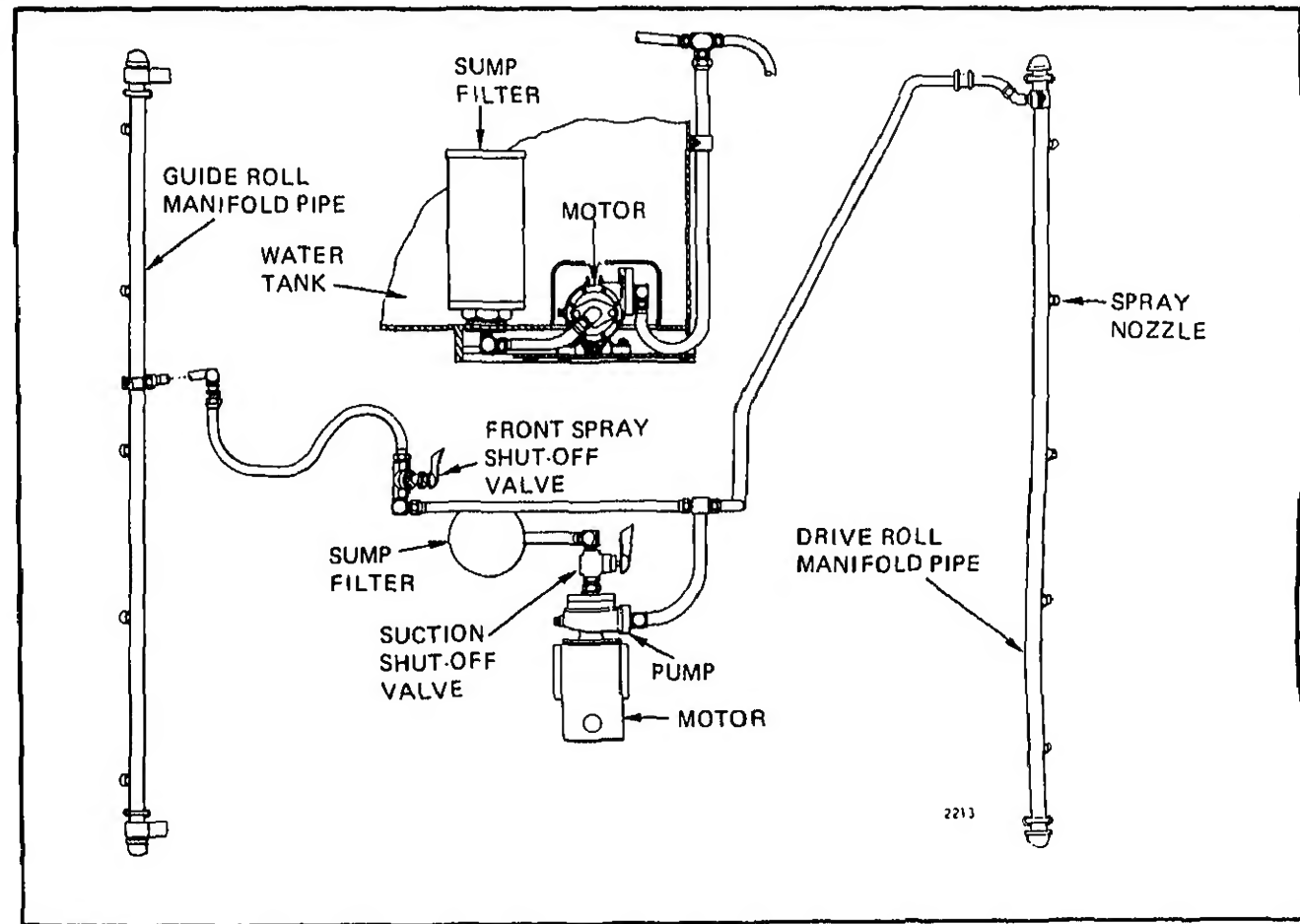
electrically energized it rotates the centrifugal pump. This causes the water to gravity feed from the tank into the pump, the pump then pressurizes the water to about 10 PSI (0.7 kg/cm²). Water then flows through the lines to the spray manifolds. Each manifold distributes the water to the drum(s).

11-6. The non-corrosive sump filter normally requires no maintenance because of the self-cleaning action of the water washing back and forth in the tank. The filter should be cleaned when the tank needs cleaning because of excessive accumulation of foreign material (see figure 11-2).

11-7. CHECKS AND ADJUSTMENTS.

11-8. SPRAY MANIFOLDS.

11-9. The water spray angle is adjusted by rotating the spray manifold. Check to see that the spray pattern completely covers the drum(s). Adjust the spray pattern so that spray



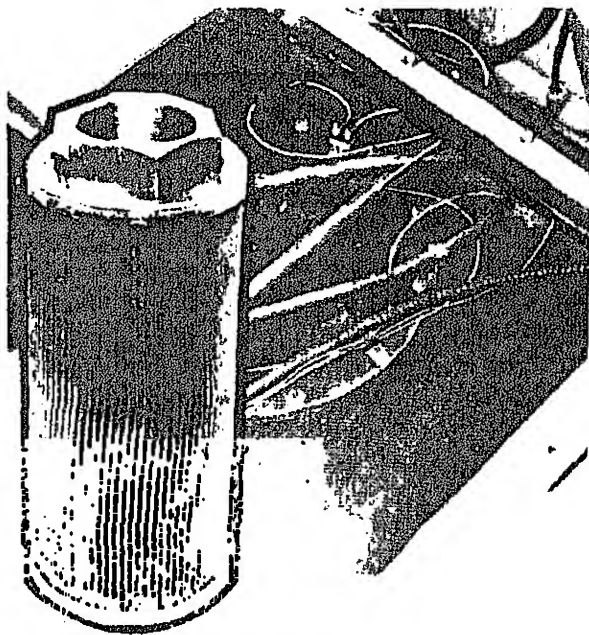


FIGURE 11-2.

strikes drum at upper edge of coco mat. Adjust as follows:

- a. Loosen the manifold mounting U-bolts.
- b. Rotate the manifold to give desired spray pattern.
- c. Re-tighten the U-bolts when desired pattern adjustment is completed.

11-10. WATER PRESSURE.

11-11. Water pressure and flow can be varied by turning the (spray) control valve located in the operator's compartment directly below the steering wheel. If greater pressure is desired on the drive drum the front (guide roll) spray can be restricted by turning the shut-off valve located under the unit steering wheel.

11-12. CHECKING MOTOR BRUSHES (see figure 11-3).

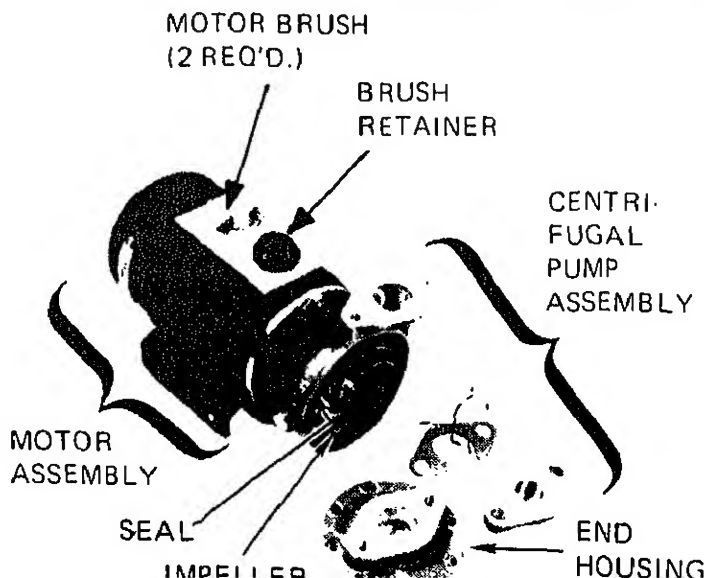
WARNING: Be sure ignition key switch and water spray switch are in the **OFF** position before inspecting brushes.

11-13. To inspect the brushes, unscrew the brush retainers. Blow out any brush "dust" with compressed air. Check for at least 3/8 inch (9.5 mm) of brush length at the shortest point.

11-14. Examine the commutator for burns, pits or wear. The space between the segments should be clean and free of deposits. Replace motor if commutator is damaged.

11-15. REMOVAL OF PUMP AND MOTOR ASSEMBLY.

- a. Turn the shut-off valve located at the pump under the unit (see figure 11-4).
- b. Disconnect electrical wiring, pressure and suction lines (see figure 11-4).



screws and lower unit to floor.

WARNING: Support mounting plate during capscrew removal. **DO NOT** allow subassembly to fall.

11-16. REPAIR.

11-17. Determine if pump or motor has failed. Separate pump or motor and replace failed unit. Refer to CHECK MOTOR BRUSHES paragraph 11-12.

NOTE: The pump impellar is pressed on the armature shaft.

11-18. INSTALLATION OF PUMP AND MOTOR ASSEMBLY.

11-19. Install pump and motor assembly by reversing procedure presented in paragraph 11-15.

11-20. CLEANING THE WATER TANK.

a. Drain the water tank for periodic cleaning by removing the drain plug located under the unit (see figure 11-5). An access plate is located at the front of the unit frame.

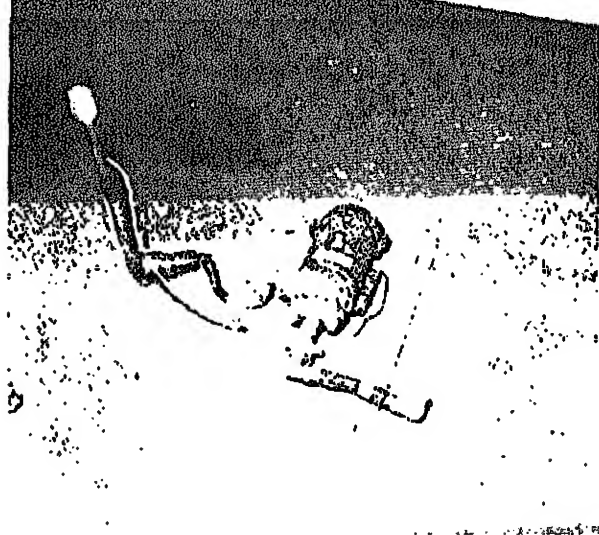
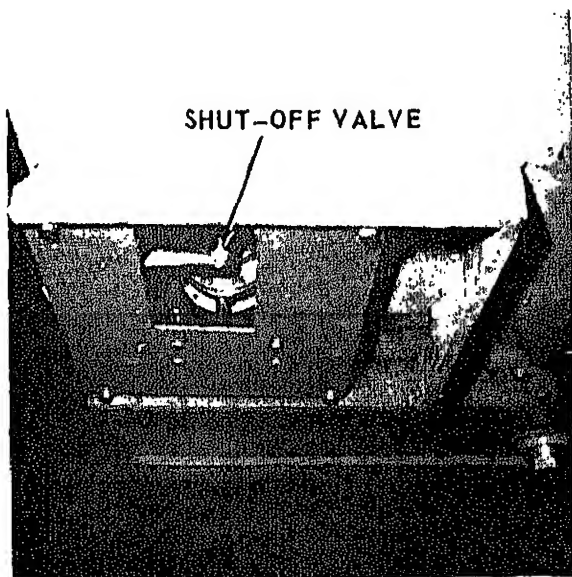


FIGURE 11-4.

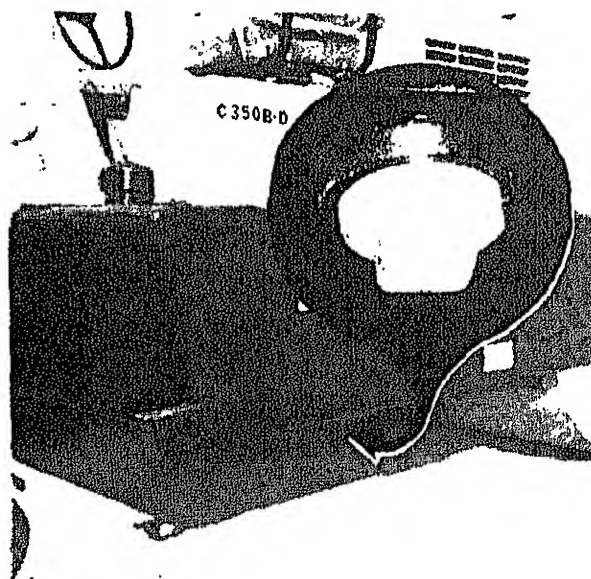


FIGURE 11-5.

La Prudence Paye
La Seguridad Paga
Betriebssicherheit Macht Sich Bezahlt
Passaa Olla Huolellinen
Veiligheid Voor Alles
Säkerhet Först
Essere Sicuro Paga
Segurança Paga
Sikkerhet Først
Pinter Be Awas

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PART II

**SUPPLEMENTAL OPERATING MAINTENANCE
AND
REPAIR PARTS INSTRUCTIONS**

**STEEL WHEEL ROLLER C350B
CONTRACT NO. DSA 700-74-C-9024**

ROLLER, MOTORIZED, STEEL WHEEL 2 DRUM TANDEM 10-14 TON
MODEL C350BD

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*This publication superseded USMP 5-3895-348, dated Jul 76.

B	Warranty Guidelines
C	Maintenance Allocation Chart
D	Modification Procedure
E	Basic Issue Items List
F	Prescribed Load List (PLL) & Authorized Stockage List (ASL)
G	Additional Repair Parts
H	Sample Format, DA Form 2765, Request (Part Number)
I	Sample Format, MILSTRIP Request (NSN)
J	Sample Format, MILSTRIP Request (Non-NSN)
K	Sample Format, MILSTRIP Request (Non-NSN Manual)
L	Maintenance & Operating Supply List
M	Preventive Maintenance Checks & Services
	Operator/Crew PMCS
	Organizational PMCS
N	HYSTER Technical Publication Correction
O	HYSTER Technical Publication Correction

1-3. CCE Item. The term "CCE" Item used in this publication applies to a standard commercial item of commercial equipment that has been approved for a specific TOE requirements and is procured and supported under the CCE System Plan. This plan permits maximum utilization of the civilian construction industry's competitive research and development, manufacturer's equipment publications and commercial sources for repair parts.

1-4. Description. The CCE Roller Steel Wheel is manufactured by Hyster Co. of Kewanee, IL. It is powered by an in-line three cylinder (3-53 series) Detroit Diesel Engine. The final drive consists of an internal, double reduction planetary system located within the left side of the single drive drum. Engine power is transferred to the final drive assembly by a closed hydrostatic transmission system. The steering system is a hydrostatic operated, manually controlled system, with provisions for manual steering.

1-5. Operational Concept. The CCE Roller, Steel Wheel will be deployed worldwide as a replacement for the following: 5-8 Ton Roller (LIN S11068), 8-12 Ton Roller (LIN S11136), 9-14 Ton Roller (LIN S11205) and (LIN S11273). It will also partially replace the 10 Ton Roller listed under LINs S11479 and S11616.

The Roller is intended for use in road construction and rehabilitation, airfield, heliport and port construction. Primary tasks are breakdown and finish rolling asphalt pavements and asphalt patch work. Secondary uses are compaction of pavement base courses and stabilized bases and pavements.

1-6. Procurement Status. The procurement contract number is DSA 700-74-C-9024, and was awarded June 1974.

will be overpacked and shipped with each Roller (reference Appendix

b. Additional commercial manuals may be obtained by requisition from Defense Construction Supply Center (DCSC). Requisitions to DCSC should be prepared in the same manner as for part numbered repair items using the Federal Supply Code for manufacturer's FSCM and manual numbers listed in Appendix A. If DD Form 1348-6 is used, mail it direct to Commander, DCSC, ATTN: DCSC-OSR, Columbus, OH 43215.

c. If additional assistance is required, contact the address in paragraph 1-11 of this publication.

1-8. Personnel and Training.

a. MOS Requirements:

- (1) Operator: 62J20, General Construction Machine Operator.
- (2) Organizational Maintenance: 62B20, Construction Equipment Repairman.
- (3) Direct and General Support Maintenance: 62B30, Construction Equipment Repairman; 63G20, Fuel and Electrical Systems Repairman, Metal Body Repairman.

b. New Equipment Training: New Equipment Training Teams (NETTs) are available to major field commands. Requests for NETTs should be forwarded to Commander, US Army Tank-Automotive Materiel Readiness (TARCOM), ATTN: DRSTA-MLT, Warren, MI 48090. Training teams should be requested only when trained personnel are not available in the command to operate and/or maintain the Roller.

1-9. Logistics Assistance.

a. Tank-Automotive Command Field Maintenance Technicians stationed at CONUS and OCONUS installations will be fully qualified and available to furnish on-site training and or assistance concurrent with receipt of the Roller.

b. Assistance can be obtained by contacting the Logistics Assistance Office listed in Appendix B or AR 700-4.

1-10. Warranty. The CCE Roller contractor warrants the products furnished under this contract according to the terms and conditions described in the equipment publications and Appendix B of this publication. All

lines.

1-11. Reporting. You can improve this publication by recommending improvements, using DA Form 2028 (Recommended Changes to Publications and Blank Forms) and mail direct to Commander, US Army Tank-Automotive Materiel Readiness Command, ATTN: DRSTA-MVB, Warren, MI 48090.

SECTION II

MAINTENANCE

2-1. Maintenance Concept. The CCE Roller will not require any new or special maintenance considerations. All maintenance functions can be accomplished within the current maintenance concepts established for construction equipment.

a. Operator/Crew Maintenance: Operator and crew maintenance is limited to daily preventive maintenance checks and services.

b. Organizational Maintenance: Organizational maintenance consists of scheduled preventive maintenance services, minor repairs and adjustments.

c. Direct Support Maintenance: Direct support maintenance consists of repairs on-site or in a direct support unit's shops. Repairs are accomplished with a minimum of tools and test equipment; the assemblies and end items thus repaired are returned to their users.

d. General Support Maintenance: General support maintenance overhauls selected assemblies and repairs items designated by the area support command for return to stock.

e. Depot Maintenance: Depot Maintenance overhauls end items and selected major assemblies when they are required to satisfy overall Army requirements. Overhaul of the end item may also be performed by contract with the manufacturer.

2-2. Maintenance Allocation Chart. Maintenance will be performed as necessary by the category indicated in the Maintenance Allocation Chart (MAC) (Appendix C) to retain or restore serviceability. All authorized maintenance within the capability of a using organization will be accomplished before referring the item to support maintenance. Higher categories will perform the maintenance functions of lower categories when required or directed by the appropriate Commanders. Using and support units may exceed their authorized scope and functions in the

2-3. Modifications. Modifications will be accomplished by the end item manufacturer after TARCOM approves the field campaign or modification plan. See Appendix D.

2-4. Equipment Improvement Recommendations (EIR). Equipment Improvement Recommendations will be submitted in accordance with TM 38-750.

2-5. Equipment Readiness Reporting. Readiness Reporting will be accomplished as required by the current TM 38-750.

2-6. Maintenance Expenditure Limits. The average life expectancy for the Roller is 15 years.

<u>PERCENT OF REPAIR</u>	<u>YEAR</u>
50%	1982
45%	1985
40%	1987
35%	1989
30%	1991
20%	1993
10%	1994

2-7. Shipment and Storage.

a. Shipment and Storage. Refer to TB 740-97-2 for procedures covering preservation of equipment for shipment and storage.

b. Administrative Storage. Refer to TM 740-90-1 for instructions covering administrative storage of equipment.

2-8. Destruction to Prevent Enemy Use. Refer to TM 750-244-3 for procedures covering destruction of equipment to prevent enemy use.

2-9. Fire Protection.

a. A hand operated fire extinguisher may be installed at the discretion of the using unit.

b. Approved hand-portable fire extinguishers are listed in TB 5-4200-200-10.

2-10. Basic Issue Items List (BILL). See Appendix E for a list of items which accompany the end item or are required for operation and/or operator's maintenance.

2-12. Special Tools and Equipment. No special tools or equipment are required for operation and maintenance of the Roller.

2-13. Maintenance Forms and Records. Operational, Maintenance and Historical records will be maintained as required by the current TM 38-750.

2-14. Towing the Roller. Before towing a unit that has malfunctioned ensure that the transmission by-pass valve is in the open position and park brake has been released. The by-pass valve is located under the hood next to the batteries. After towing be sure that the by-pass valve has been closed.

CAUTION: The by-pass valve is not intended for towing a unit from one job site to another. Tow at speeds of one (1) to (2) MPH for as short a distance as possible.

2-15. Starting the Roller.

a. Always set the park brake by moving the control lever to BRAKE ON position (up).

b. Place the Direction-Throttle Bail in Neutral detented position (vertical).

c. Start engine.

2-16. Safety Precautions. Always observe the following safety precautions to prevent possible injury to personnel and damage to the equipment.

a. TRAINED OPERATIONS ONLY.

b. Always use slower unit speeds and added caution when operating close to a lift edge or when traveling downhill.

c. Never travel across a slope. Always travel up or down a slope.

d. Always engage the parking brake before dismounting the unit.

e. Never shut down the engine when traveling up or down a slope. Always move the Direction-Throttle Bail toward the neutral position to slow the unit.

3-1. General.

a. The basic policies are procedures in AR 710-2, AR 725-50 and DA Cir 700-27 are generally applicable to repair parts management for CCE items.

b. Manufacturer's parts manuals are furnished with CCE items instead of Department of the Army Repair Parts and Special Tool List (RPSTL).

c. National Stock Number (NSNs) are initially assigned only to PLL/ASL parts and major assemblies, i.e. engines, transmissions, etc. Additional NSNs are assigned by the supply support activities as demands warrant.

d. Proper use of project codes and weapon systems designator codes on parts requisitions is essential.

e. Automated Processing (AUTODIN) of Federal Supply Code Manufacturer (FSCM) part number requisitions, without edit for matching NSNs and exception data, is authorized.

f. Repair parts are available from commercial sources and may be purchased locally in accordance with AR 710-2 and AR 734-110.

g. Initial Prescribed Load List (PLL) and Authorized Stock List (ASL) will be distributed by US Army Tank-Automotive Materiel Readiness Command, (TARCOM), ATTN: DRSTA-FH.

3-2. Prescribed Load List (PLL). The PLL distributed by TARCOM is an estimated 15 days supply recommended for initial stockage at organizational maintenance. Management of PLL items will be governed by the provisions of AR 710-2 and local command procedures. Selection of PLL parts for shipment to CONUS/OCNUS units is based upon the receiving Command's recommendation after their review of the TARCOM prepared list. Organizations and activities in CONUS/OCNUS will establish PLL stocks through normal requisitioning process.

3-3. Authorized Stockage List (ASL). The ASL distributed by TARCOM is an estimated 45 days supply of repair parts for support units and activities. The ASL parts will be shipped according to the recommendations of the receiving commands, after they have reviewed the initial list distributed by TARCOM. Support units and activities in CONUS/OCNUS will establish ASL stocks through normal requisitioning process.

will be prepared according to AR 710-2 and local command directives. All requisitions will have the Weapons System Designator code "BD" (Interim Change 5-1, AR 710-2 per DA Message, DALO-SMS 091400Z Jun 78) entered in the 2nd and 3rd positions of block 18. Units in CONUS will use project code "BGW" in block 19. Units OCONUS will enter in block 19 project code "JZC", Appendix H

b. Support Units and Activities:

(1) General: All MILSTRIP requisitions (DD Form 1348 Series) prepared for repair parts support of CCE items will include distribution and project codes, see Appendixes I, J and K.

(2) Distribution Code: Supply customers in CONUS will use code "F" in card column 54. Customer OCONUS will use the appropriate code from Appendix P, paragraph P-3a(1) AR 725-50. Weapons System Designator code "BD" (DA Message 091400Z, DALO-SMS, June 78), will be entered in card columns 55 and 56 of all requisitions for parts to support the roller.

(3) Project Codes: The applicable project code will be entered in card columns 57-59 of requisitions for Non-NSN parts, whether CONUS or OCONUS customers. Project code "BGW" will be used by CONUS customers when requisitioning part numbered parts. Supply customers OCONUS will use project code "JZC" for part numbered parts.

3-5. Submitting Requisitions.

a. Using Units and Organizations will submit DA Form 2765 Series requisitions to designated support units or activities in accordance with local procedures.

b. Support units and activities will forward MILSTRIP requisitions for NSN parts through the Defense Automated Addressing System (DAAS) to the Managing Supply Support Activity. Requisitions for part numbered part will be forwarded through DAAS to the Defense Construction Supply Center (DCSC).

NOTE: When the manufacturer's part number and Federal Supply Code for Manufacturer (FSCM) exceed the space in card columns 8 through 22 of A02/A0B requisitions, prepare an A05/A0E requisition (DD Form 1348-6) and mail it to Commander, Defense Construction Supply Center, ATTN: DCSC-OSR, Columbus, OH 43215.

REFERENCES

A-1. Publications

Logistic Assistance Program
Material Management for Using Units, Support Units and Installations.
Requisitioning Receipt, and Issue System

Indexes should be consulted frequently for latest changes of revisions of references and for material relating to material covered in this publication.

Index of Administrative Publications
Index of Blank Forms.
Index of Doctrinal Training and Organization Publications.
Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply
Bulletins and Lubrication Orders
Index of Graphic Training Aid and Devices

A-2. Forms

Refer to TM 38-750, The Army Maintenance Management System (TAMMS), for instructions on maintenance forms pertaining to the materiel.

A-3. Other Publications

The following publications contain information pertinent to the major item and associated equipment:

a. *Camouflage.*
Camouflage.
b. *Decontamination.*
Chemical, Biological, and Radiological (CBR) Decontamination.
NBC (Nuclear, Biological and Chemical) Defense.
c. *General.*
Utilization of Engineer Construction Equipment
Basic Cold Weather Manual
Northern Operations
Operation and Maintenance of Ordnance Materiel in Cold Weather (0° to -65° F).
Procedures for Destruction of Equipment to Prevent Enemy Use
d. *Maintenance and Repair.*
Inspection, Care and Maintenance of Antifriction Bearings
Welding Theory and Application.
Hand Portable Fire Extinguishers Approved for Army Users. 'TB 5-
e. *Administrative Storage.*
Administrative Storage of Equipment
Preservation of USAMECOM Mechanical Equipment for Shipment and Storage.

1. A warranty period of 12 months applies to the Roller, Motorized, Steel Wheel, Model C350B-D, Contract Number DSA 700-74-C-9024, manufactured by HYSTER Co. after delivery to the Government. This warranty applies to the end item, components and all supplies furnished under the contract.

2. Using units may not contact their local dealer. You must mail DA Form 2407 to the Maintenance Directorate, TARCOM, at the following address: US Army Tank-Automotive Material Readiness Command, ATTN: DRSTA-MVB, Warren Michigan 48090. To expedite actions you may call the information to AUTOVON 273-3349 or 273-3439 with the information from your DA 2407, section 1, block 1 through 11, blocks 16, 17, 18 and 20.

3. General information:

a. DA Form 2407 (prepared in accordance with warranty claim actions in TM 38-750) will be used to submit warranty claim actions for end items when components, parts or assemblies are defective and are covered by a manufacturer's warranty. End items under warranty are identified by a decal plate and/or warranty statement included in the operator's and maintenance manual for the end item. All warranty actions settled or unsettled will be reported to the National Maintenance Point (NMP) on DA Form 2407. For warranties settled locally the DA Form 2407 will contain a statement "For Information Only" in block 35.

b. Maintenance activities in support of organizational maintenance are the responsible points of contact between the originator of warranty claims and the National Maintenance Point (US Army Tank-Automotive Material Readiness Command, DRSTA-MVB, AUTOVON 273-3349, or 273-3439 Warren, Michigan 48090, which serves as the DA Representative with the contractor in warranty matters.

NOTE: In certain instances, the originating organization and the support activity are one and the same.

c. Before you take your equipment to a dealer for repair, whether or not it was necessary for you to go through the NMP (TARCOM), check with your local procurement office to see if a funds commitment document is needed. Sometimes, even though the majority of the repairs are covered by the warranty, there may be a small charge for normal maintenance costs, i.e., oil filters, oil, etc. Further, the cause of damage could be determined by the dealer to be directly related to "operator abuse." In that case, the Government may be obligated to pay for tear-down services even if the repairs are no longer desired, or for the complete cost if repairs are to be completed by the dealer.

and the charges, if any, which may be incurred. Leave the name and telephone number of the person to be contacted for pickup of the equipment and specifically state that he should be called as soon as repairs are finished. In addition, state he should be telephoned if unexpected problems, costs and/or delays are encountered. Get the name and telephone number of the Service Manager, for any required follow-up purposes.

e. When you arrive to pick up your equipment after completion of services, make certain that you know exactly what repairs were performed and/or parts replaced. This is required for overall problem trend analysis by the NMP and must be identified upon completion of warranty services.

f. Telephone the NMP at TARCOM, AUTOVON 273-3349, 273-3439 or 273-3387 if:

(1) Your equipment requires repairs and you cannot obtain these services using the procedures listed above.

(2) The length of time required for repairs may seriously hamper your mission, or if the dealer's overall response to your requirements are not satisfactory.

(3) You have any questions regarding warranty procedures - either in general or about a specific job. Do not wait until your problem becomes critical.

g. Do not attempt to conduct negotiations regarding a breach of warranty. This is a function of the Contracting Officer, through the NMP at TARCOM.

Section I. INTRODUCTION

1. General: This Maintenance Allocation Chart designates responsibility for performance of Maintenance functions to specific Maintenance categories.

2. Maintenance functions:

a. Inspect: To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. Test: To verify serviceability and detect incipient failures by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service: Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust: To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align: To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate: To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install: The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace: The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair: The application of maintenance services or other maintenance actions to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to new condition.

k. Rebuild: Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurement (hours/miles, etc) considered in classifying Army equipments/components.

3. Column entries: Columns used in the Maintenance allocation chart explained below:

a. Column 1, Group Number: Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies modules with the next higher assembly.

b. Column 2, Component/Assembly: Column 2 contains the noun name components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions: Column 3 lists the functions to be performed on the item listed in Column 2.

d. Column 4, Maintenance Category: Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary among different maintenance categories, appropriate "work time" figures will be shown for each category. The number of manhours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the Maintenance Allocation Chart.

e. Column 5, Tools and Equipment: Column 5 specifies by code the common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks: Column 6 contains an alphabetic code which leads to the remark in Section IV, Remarks, which is pertinent to the item opposite the particular code.

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip- ment
			C	O	F	H	D	
01	ENGINE							
0100	Engine Assembly	Test		2.0				
		Service	0.1					
		Replace			16.0			
		Repair			21.0			
		Overhaul				48.0		
	Engine Mounts	Replace		3.0				
0101	Cylinder Block	Test				5.0		
		Replace				40.0		
		Repair				16.0		
	Cylinder Sleeve	Replace				3.0		
	Cylinder Head	Replace			4.0			
		Repair				4.0		
		Overhaul				8.0		
0102	Crankshaft	Replace				5.0		
	Main Bearings	Replace				4.0		
	Drive Pulley	Replace		2.0				
0103	Flywheel	Replace			3.0			
0104	Pistons & Connecting Rods	Replace				3.0		
		Repair						
	Rings & Bearings	Replace						

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tool Equip ment
			C	O	F	H	D	
0105	Rocker Arms	Replace			0.5			
	Valve Springs	Test				0.8		
		Replace				0.3		
	Valves, Exhaust	Adjust			2.0			
		Replace				1.0		
		Repair				2.0		
	Camshaft, Bearings & Gears	Replace				4.0		
0106	Oil Cooler	Service		0.2				
		Replace			1.0			
	Oil Pan	Replace			1.5			
		Repair			1.0			
	Oil Pump	Replace			0.8			
		Repair			2.0			
	Oil Pressure Regulator	Adjust			0.2			
		Replace			0.5			
	Oil Filter Assembly	Service		0.5				
		Replace			1.0			
0108	Oil Filter Element	Replace		0.5				
	Exhaust Manifold	Replace			1.0			
		Repair			1.0			

*The subcolumns are as follows:
 2. Operator/crew 3. Fuel 4. Direct support

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip- ment	R
			C	O	F	H	D		
03	FUEL SYSTEM								
0301	Fuel Injector	Test			1.0				1
		Replace			1.5				
0302	Fuel Pump	Replace		1.0					1
		Repair			1.0				
0304	Air Cleaner	Service	0.4						1
		Replace		1.0					
		Repair		0.5					
	Air Cleaner Element	Replace		0.5					
0305	Blower, Air Intake	Service		0.3					1
		Replace			1.0				
		Repair			2.0				
0306	Fuel Tank	Service		0.2					1
		Replace			1.5				
		Repair				1.0			
	Lines & Fittings	Replace		1.0					1
0308	Governor, Engine Speed	Test			0.5				
		Adjust			0.5				
		Replace			1.0				
		Repair				2.0			

*The subcolumns are as follows:

C--operator/crew

F--direct support

D--depot

O--organizational

H--general support

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category				
			C	O	F	H	D
0309	Fuel Filters	Service	0.2				
	Fuel Filter Element	Replace		0.5			
0312	Throttle Control/Linkage	Adjust			0.1		
		Replace			0.4		
04	EXHAUST SYSTEM						
0401	Muffler & Exhaust Pipes	Replace		1.0			
05	COOLING SYSTEM						
0501	Radiator	Service	0.2				
		Replace		2.0			
		Repair			2.0		
0503	Thermostat	Replace		1.0			
	Hoses & Clamps	Replace		0.5			
0504	Water Pump	Replace		2.0			
		Repair			1.0		
0505	Fan Assembly	Replace		1.0			
		Repair			1.0		
	Fan Belts	Inspect		0.1			
		Adjust		0.5			
		Replace		1.0			
06	ELECTRICAL SYSTEM						
0601	Alternator	Test		0.1			
		Replace		0.5			
		Repair			1.5		

*The subcolumns are as follows:

C--operator/crew

F--direct support

D--depot

O--organizational

H--general support

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (CCE)

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip- ment	(6) Remarks
			C	O	F	H	D		
0603	Alternator Drive Belt	Inspect	0.1						
		Adjust		0.2					
		Replace		0.2					
	Starting Motor	Test		0.2					1,2,5
		Replaced		1.0					
		Repair			1.5				
0607	Instrument Panel Accessories	Replace		0.5					1,5
		Repair		0.7					
0608	Miscellaneous Electrical Items: (Switches, Circuit Breakers, etc)	Replace		0.5					1,5
0609	Head Light Assembly	Replace		0.2					1,5
		Repair		0.4					
	Head Light Lamp Units	Replace		0.2					
0610	Sending Units/Warning Switches.	Replace		0.2					1,5
0611	Horn Assembly	Replace		0.3					1,5
0612	Battery	Inspect	0.1						1,5
		Test		0.3					
		Service	0.2						
	Battery Cables	Replace		0.5					
		Replace		0.4					
		Repair		0.5					

*The subcolumns are as follows:

C--operator/crew

F--direct support

D--depot

O--organizational

H--general support

Section II. MAINTENANCE ALLOCATION CHART

ROLLER MOTORIZED, STEEL WHEEL 2 DRUM TANDEM, 10-14 TON (COE)

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip- ment
			C	O	F	H	D	
0613	Wiring Harness	Replace		1.0				
		Repair		1.0				
07	TRANSMISSION SYSTEM							
0721	Hydraulic Tank	Service	0.2					
		Replace			3.0			
		Repair			3.0			
	Suction Filter	Service		0.3				
		Replace		1.0				
	Hydrostatic Pump	Replace			2.0			
		Repair			2.0			
		Overhaul				4.0		
	Servo Control Valve	Replace			1.5			
		Repair			2.0			
	Direction-Throttle Control Assy	Service		0.2				
		Adjust			1.0			
		Replace			2.0			
		Repair			2.0			
	Hydrostatic Motor	Replace			1.5			
		Repair			3.0			
		Overhaul				4.0		
	Transmission By-Pass Valve	Replace			1.0			

*The subcolumns are as follows:
 C--operator/crew F--direct support

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip- ment	(6) Remarks
			C	O	F	H	D		
11 1100	Hydraulic Oil Cooler	Repair			1.0				
		Service		0.3					
		Replace			1.5				
		Repair			2.0				
	Oil Return Filter	Service		0.3					
		Replace		1.0					
	Case Pressure Relief Valve	Replace			1.0				
		Repair			1.0				
	Lines & Fittings	Replace		1.0					
		Repair		1.0					
	FINAL DRIVE								
	Drive Drum Assembly	Replace			2.0				1,2,3,4
		Repair			3.0				
	Motor Carrier Assembly	Replace			1.5				
		Repair			2.5				
12 1201	Final Drive Assembly	Service		0.5					1,2,3,4
		Replace			3.0				
		Repair			3.0				
		Overhaul				8.0			
	PARKING BRAKE SYSTEM								
	Brake Lever	Adjust		0.4					1

*The subcolumns are as follows:

C--operator/crew F--direct support

D--depot

O--organizational H--general support

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip- ment	Re
			C	O	F	H	D		
14	Cable & Linkage	Replace		1.0					
		Repair		1.0					
		Replace		1.0					
		Repair		1.0					
	Brake Shoe	Replace		2.0					
		Repair			1.0				
	Brake Drum	Replace		2.0					
		Repair			1.0				
1401	STEERING SYSTEM								
1401	Steering Wheel	Replace		1.0					1
1405	Guide Rolls	Replace			3.0				1,2
		Repair			1.0				
	Axle Shaft Bearings	Service		0.2					
		Replace			4.0				
	Yoke & Pin Assembly	Repair			3.0				
		Service			3.0				
1407	Steering Control Unit	Replace			3.0				
		Repair			2.0				
		Replace			2.0				1,2
1410	Hydraulic Pump	Repair			2.0				
		Replace			2.0				
		Repair			2.0				

*The subcolumns are as follows:

C--operator/crew

F--direct support

O--organizational

H--general support

D--depot

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip- ment	(6) Remark
			C	O	F	H	D		
		Overhaul			4.0				
1411	Roses, Lines & Fittings	Replace		1.0					1
1412	Steering Cylinder	Service		1.0					1,2
		Replace			1.5				
		Repair			2.0				
1414	Flow Divider	Replace			1.5				1,2
		Repair			1.0				
15	FRAME								
1501	Frame Assembly	Repair			4.0				1,2
18	BODY, HOOD & COWLING								
1801	Hood & Cowling	Replace		1.0					1
		Repair		1.5					
1806	Seat Assembly	Replace		1.0					1
		Repair		1.0					
1808	Tool Box	Replace		0.5					1
		Repair		0.5					
21	EARTH MOVING EQUIPMENT COMPONENTS								
2100	Roll Scrapers	Service		0.2					1
		Replace		1.0					
		Repair		1.0					
	Roll Mat	Replace		0.5					

*The subcolumns are as follows:

C--operator/crew

F--direct support

D-depot

H--general support

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools Equip- ment
			C	O	F	H	D	
7471	Water Spray System Tank	Service		0.5				
	Spray Pump & Motor	Replace		2.0				
		Repair			2.0			
	Water Tank Inlet Screen	Service		0.3				
		Replace		0.3				
	Water Tank Sump Filter	Service		0.3				
		Replace		0.3				
	Spray Manifolds & Nozzles	Service		0.5				
		Replace		0.5				
		Repair		1.0				
	Spray Pipes, Valves & Hoses	Replace		1.0				
		Repair		1.0				

*The subcolumns are as follows:

C--operator/crew

F--direct support

D--depot

O--organizational

H--general support

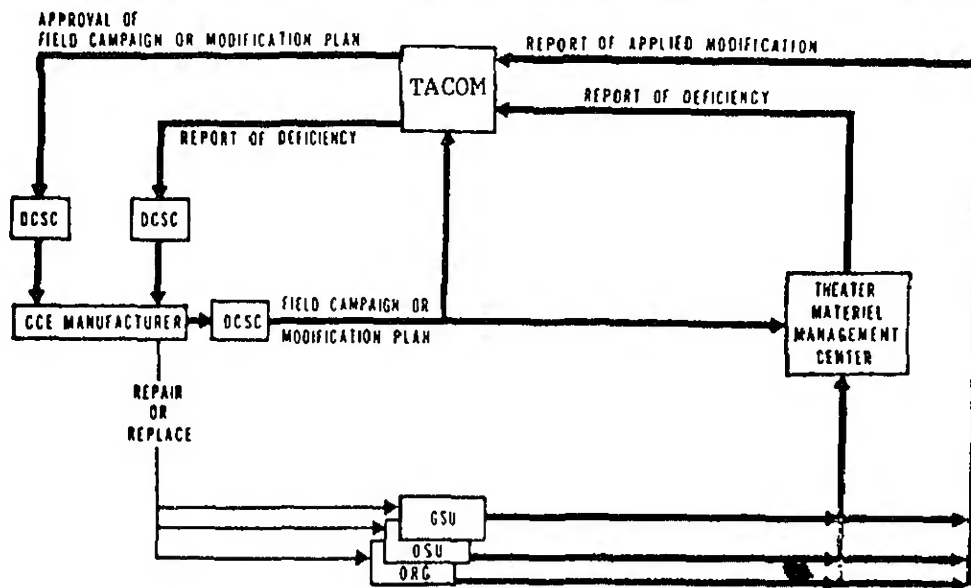
SECTION III - TOOL AND TEST EQUIPMENT REQUIREMENTS

TEST EQUIPMENT CATEGORY	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
		Unless otherwise noted, all maintenance functions can be accomplished with the tools contained in the following common two sets.		
	O, F, H	Shop Equip Contact Maint. TRK MTD (SC 4940-97-CL-E-05)	4940-00-294-9518	T10138
	O, F, H	Shop Equip Org Repair, Light TRK MTD (SC 4940-97-CL-E04)	4940-00-294-9516	T13152
	O, F, H	Tool Kit Automotive Maint, Org Maint Common #1 (SC 4910-95-CL-A74)	4910-00-754-0654	W32593
	O, F, H	Tool Kit Automotive Maint, Org Maint Common #2 (SC 4910-95-CL-A72)	4910-00-754-0650	W32730
	O, F, H	Tool Kit, Light Weight (SC 5180-90-CL-W26)	5180-00-177-7033	W33004
	O, F, H	Shop Equip Auto Maint and Repair Org Maint Supp #1 (SC 4910-95-CL-A73)	4910-00-754-0653	W32867
	O, F, H	Shop Equip Welding Field Maint (SC 3470-95-CL-A08)	3470-00-357-7268	T16714
	O, F, H	Tool Sct, Veh Full Tracked Sugg #2 SC 4940-95-CL-A08	4940-00-754-0743	W657147
	F, H	Shop Equip Gen Purp Repair Semitrler MTD (SC 4940-97-CL-E03)	4940-00-287-4894	T10549
	F, H	Tool Kit Automotive, Fuel and Elec Sys Repair (SC 4910-95-CL-A50)	5180-00-754-0655	W32456
	F, H	Tool Kit, Master Mechanic and Equip Maint and Repair	5180-00-699-5273	W45060

SECTION III - TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
2	F, H	Shop Set, Fuel and Elec Sys Field Maint Basic (SC 4910-95-CL-A01)	4910-00-754-0714	T30414
2	F, H	Shop Set, Fuel and Elec Sys Field Maint Basic Sup #2 (SC 4910-95-CL-A65)	4910-00-390-7775	T30688
2	F, H	Shop Equip Machine Shop, Field Maint Basic (SC 3470-95-CL-A02)	3470-00-754-0708	T15644
2	F, H	Measuring and Lay Out Tool Set, Mach (SC 5280-95-CL- A02)	5280-00-511-1950	W44512
2	F, H	Tool Kit Body and Fender Repair	5180-00-754-0643	W33689
3	F, H	Wrench Set Socket, 3/4" Drive Hex Type	4940-00-754-0743	W65747
4	O, F, H	Wrench Torque, 3/4" Drive 500 lb Cap	5120-00-542-5577	Y84966
5	O, F, H	Multimeter	6625-00-999-7465	M80242

CCE MANUFACTURER FIELD CAMPAIGNS AND MODIFICATION PROCEDURES



— FLOW OF REPORTING
 — FIELD CAMPAIGN OR MODIFICATION PLAN

BASIC ISSUE ITEMS LIST

NOMENCLATURE:
MANUFACTURER:
SERIAL NUMBER RANGE.

DATE:

(1) MFR PART NO.	(2) MFR FED CODE	(3) DESCRIPTION	(4) UNIT OF ISSUE	(5) QUANTITY FURNISHED W/ISSUE
		N-O-N-E		

ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR CODE	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION REF No & MFR CODE USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY AUTH
	-	NOTE: The following items are overpacked with the roller.		
	7520-00-559-9618	Case, Cotton Duck: MIL-B- 11743 (81349)	EA	1
	7510-00-889-3494	Log Book Binder: MIL-B-43064	EA	1
		NOTE: The following items are authorized but not issued with the roller.		
	4210-00-889-2221	Extinguisher, Fire Dry Chemical	EA	1
	4930-00-277-9525	Grease Gun, Hand	EA	1
	4930-00-204-2550	Adapter, Grease Gun Coupling, Rigid	EA	1
	4930-00-288-1511	Adapter, Grease Gun Coupling, Flex	EA	1

INITIAL RECOMMENDATION
 PRESCRIBED LOAD LIST (PLL)
 AUTHORIZED STOCKAGE LIST (ASL)

APPENDIX F

END ITEM: Roller, Motorized, Steel Wheel, 2 Drum Tandem 10-14 Ton (CCE)		MAKE:	HYSTER		MODEL:	C350B-D	
MFR PART NO:		N/A	3895-00-578-0372		SERIAL NUMBER RANGE		DATE
SAR CODE	NATIONAL STOCK NUMBER	PART NUMBER	FSCIA	PART DESCRIPTION	U/M	QTY OF FOR NO.	
						PLL	1-5
PA0ZZ	2940-00-019-8087	5574978	72582	Element, Engine Oil Filter	EA	1	1
PA0ZZ	2910-00-792-8985	5774961	72582	Element, Primary Fuel Filter	EA	1	1
PA0ZZ	2910-00-890-2436	5573261	72582	Element, Secondary Fuel Filter	EA	1	1
PA0ZZ	3030-00-899-4888	154382	30076	V-Belt, Alternator	EA	1	1
PA0ZZ	2940-00-755-6584	180595	30076	Element, Hydraulic Oil Filter	EA	1	1
PA0ZZ	2940-00-368-8338	156954	30076	Element, Air Cleaner	EA	1	3
PA0ZZ	3030-00-982-1212	5126447	72582	V-Belt, Matched, Fan	EA	1	1
PA0ZZ	2540-01-042-5750	157321	30076	Cocoa Mat	EA	1	1

PAGE

<u>NSN</u>	<u>P/N</u>	<u>FSCM</u>	<u>Description</u>
4720-01-013-1355	100434	30076	Hose, Radiator, Upper
4720-01-013-1354	169107	30076	Hose Radiator, Lower
2940-00-019-8087	5574978	72582	Element, Engine Oil Filter
2910-00-792-8985	5774961	72582	Element, Primary Fuel Filter
2910-00-890-2436	5573261	72582	Element, Secondary Fuel Filter
5930-00-220-6716	169776	30076	Sender, Oil Pressure
6620-00-933-3594	77328	30076	Sender, Water Temperature
5925-01-010-1084	163762	30076	Breaker, Circuit
5920-00-925-2639	53123	30076	Fuse, 5 Ampere
3030-00-899-4888	154382	30076	V-Belt, Alternator
2940-00-755-6584	180595	30076	Element, Hyd Oil Filter
4330-00-355-7750	237014	30076	Seal Element Kit, Hyd Oil Filter
5330-01-016-7837	243868	30076	Seal Kit, Steering Control
2530-00-158-1312	189585	30076	Parts Kit, Steering Control
5330-01-016-7838	223641	30076	Seal Kit, Steering Cyl
4320-00-237-3947	158913	30076	Kit - Minor, Steering Pump
6240-00-733-2984	156776	30076	Element Light, Seal Beam
6240-00-155-7859	MS15571-8	96906	Bulb, 12 Volt
5920-00-131-9915	F02832V20A	81349	Fuse, 20 Ampere
5920-00-925-2640	53124	30076	Fuse, 10 Ampere
5330-01-013-7673	169787	30076	O-Ring, Hose Flange
2940-00-368-8338	156954	30076	Element, Air Cleaner
4320-01-032-7972	190641	30076	Seal, Kit
4320-01-032-7973	267025	30076	Manifold Valve Kit, Hyd Sys
4320-01-032-7974	194393	30076	Manifold Seal Kit, Hyd Sys
3030-00-982-1212	5126447	72582	Belt-V Matched, Fan
2540-01-042-5750	157321	30076	Cocoa Mat
5330-01-043-1803	156961	30076	O-Ring, Air Cleaner
6140-00-917-2141	79792	30076	Battery, 12-Volt

USE TYPEWRITER OR BALL POINT PEN
PRESS HARD TO ASSURE LEGIBILITY ON ALL COPIES

SEND TO										REQUEST IS FROM									
STOCK NUMBER 4 7 2 0 0 1 0 1 3 1 3 5 5										Use National Stock Number (NSN)									
EDITING DATA DOC IDENT 4 7 2 0 0 1 0 1 3 1 3 5 5										STOCK NUMBER 4 7 2 0 0 1 0 1 3 1 3 5 5									
DOCUMENT NUMBER Weapons Sys Dsg. Code B D B G W										SYSTEM DESCRIPTION Hose TM 5-3895-348-14&P-1, Page 2A08									
FUND DISTRIBUTION PROJECT B D B G W										DATE POSTED DATE AVAILABLE DATE RECEIVED									
PROJECT CODE B D B G W										SIGNATURE									

(CONUS Requester)

USE TYPEWRITER OR BALL POINT PEN
PRESS HARD TO ASSURE LEGIBILITY ON ALL COPIES

SEND TO										REQUEST IS FROM									
STOCK NUMBER 4 7 2 0 0 1 0 1 3 1 3 5 5										Use National Stock Number (NSN)									
EDITING DATA DOC IDENT 4 7 2 0 0 1 0 1 3 1 3 5 5										STOCK NUMBER 4 7 2 0 0 1 0 1 3 1 3 5 5									
DOCUMENT NUMBER Weapons Sys Dsg. Code B D J Z C										SYSTEM DESCRIPTION Hose TM 5-3895-348-14&P-1, Page 2A08									
FUND DISTRIBUTION PROJECT B D J Z C										DATE POSTED DATE AVAILABLE DATE RECEIVED									
PROJECT CODE B D J Z C										SIGNATURE									

(NSN)

30

DD FORM 1348-1 MAY 74 EDITION OF 1 APR 71 MAY BE USED

DOCUMENT IDENTIFIER										ROUTING IDENTIFIER										FUND										PROJECT										VARIABLE DATA ELEMENTS																																																																																																																							
DOCUMENT IDENTIFIER CODE										ROUTING IDENTIFIER CODE										FUND CODE										PROJECT CODE										VARIABLE DATA ELEMENTS																																																																																																																							
1-3										4-6										7										8-22										23-24										25-29										30-43										44										45-50										51										52-53										54-56										57-59										60-61										62-64										65-66									
Document Identifier Code										Routing Identifier Code										Media/Status Code										FSCM and Part Number										Unit of Issue										Quantity										Document Number										Demand Code										Supplementary Address										Signal Code										Fund Code										Distribution Code										Project Code										Variable Data Elements																													

Card Column

Description of Data

Mandatory Entry for CCE

1-3 Document Identifier Code
 4-6 Routing Identifier Code
 7 Media/Status Code
 8-22 FSCM and Part Number
 23-24 Unit of Issue
 25-29 Quantity
 30-43 Document Number
 44 Demand Code
 45-50 Supplementary Address
 51 Signal Code
 52-53 Fund Code
 54-56 Distribution Code

A0B - CONUS
 A02 - Overseas
 Always S9C

CC-55-56

"F" for CONUS;
 see AR 725-50
 for OCONUS
 Weapon System Code

57-59 Project Code
 60-61 Priority Code
 62-64 Required Delivery Date
 65-66 Advice Code

70

Identification code applicable to
entry in cc 71-80.

A - Technical order or Technical
Manual.

B - End Item Identification

C - Noun Description

D- Drawing or Specification No.

Reference Identification

Identification of
reference specified
in cc 70

71-80

DOCUMENT IDENTIFIER			ROUTING IDENTIFIER				M & S	MANUFACTURER'S CODE * AND PART NUMBER															UNIT OF ISSUE	QUANTITY										DOCUMENT NUMBER																		
								FSCM					PART NUMBER																					REQUISITIONER					DATE					SERIAL								
1	2	3	4	5	6	7		8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43								
DEMAND				SUPPLEMENTARY ADDRESS				SIGNAL		FUND CODE		DISTRIBUTION CODE		PROJECT CODE		PRIORITY		RE-REQUIRED DELIVERY DATE		ADVICE CODE		BLANK												REJECT CODE (FOR USE BY SUPPLY SOURCE ONLY)																		
44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90						
IDENTIFICATION DATA																																																				
* 1. MANUFACTURER'S CODE & PART NO. (When they exceed Card Columns 8 thru 22)																						2. MANUFACTURER'S NAME																														
3. MANUFACTURER'S CATALOG IDENTIFICATION AND DATE																												4. TECHNICAL ORDER NUMBER																								
5. TECHNICAL MANUAL NUMBER																						6. NAME OF ITEM REQUESTED																														
7. DESCRIPTION OF ITEM REQUESTED																												7a. COLOR																								
																												7b. SIZE																								
8. END ITEM APPLICATION AND SOURCE OF SUPPLY																																																				
8a. MAKE																						8b. MODEL NUMBER										8c. SERIES										8d. SERIAL NUMBER										
9. REQUISITIONER (Clear Text Name and Address)																						10. REMARKS																														

DD FORM 1348-6
1 APR 77

EDITION OF 1 MAR 74 MAY BE
USED UNTIL EXHAUSTED

NON-NSN REQUISITION (MANUAL)

This form will only be used in those cases where the manufacturer's code and part number exceed the spaces allocated in card columns 8 - 22 of the requisition.

<u>CARD COLUMN</u>	<u>DESCRIPTION DATA</u>	<u>MANDATORY ENTRY FOR CCE</u>
1 - 3	Document Identifier Code	AØE - CONUS AØ5 - OCONUS
4 - 6	Routing Identifier Code	Always S9C
7	Media Status Code	
8 - 22	FSCM and Part Number	Leave Blank Enter In Block under Identifier Data
23-24	Unit of Issue	
25-29	Quantity	
30-43	Document Number	
44	Demand Code	
45-50	Supplementary Address	
51	Signal Code	
52-53	Fund Code	
54-56	Distribution Code CC 54 CC 55-56	"F" for CONUS AR 725-50 for Weapon System
57-59	Project Code	
60-61	Priority Code	
62-64	Required Delivery Date	
65-66	Advice Code	
67-80		Blank

IDENTIFICATION DATA - Lower half of DD Form 1348-6, complete Blocks 1 th

MAINTENANCE AND OPERATING SUPPLY LIST

NOMENCLATURE. Roller, Motorized, Steel Wheel 2 Drum Tandem, 10-14 Ton (CCE)		MAKE: HYSTER		MODEL: C350B-D	
MFR PART NO: N/A		NSN: 3845-00-578-0372		SERIAL NO. RANGE: _____ TO _____	
MFR PART NO: N/A		DATE: _____		Fe	
(1) COMPONENT APPLICATION	(2) MFR PART NO. OR NAT'L STOCK NO.	(3) DESCRIPTION	(4) QTY REQ F/INITIAL OPN	(5) QTY REQ F/8 HRS OPN	(6) NOTE
Fuel Tank	9140-00-286-5296	Diesel Fuel, DF2	25 Gal.	*	55 gal drum
Engine Crank- case	9150-00-189-6727	Oil Lubricating OE/HDO 10	14 qts.	*	1 qt.
	9150-00-186-6668	MIL-L-2104C			5 gal.
	9150-00-186-6681	Oil Lubricating OE/HDO 30			1 qt.
Hydraulic Reservoir	9150-00-188-9858	MIL-L-2104C			5 gal.
	9150-00-189-6727	Oil Lubricating OE/HDO 10	9 gal.	*	1 qt.
Final Drive	9150-00-186-6668	MIL-L-2104C			5 gal.
	9150-01-035-5392	Oil Lubricating G080W/90			1 qt.
	9150-01-035-5393	MIL-L-2105C	6 qts.	*	5 gal.
	9150-01-035-5394				55 gal.

MAINTENANCE AND OPERATING SUPPLY LIST

NOMENCLATURE: Roller, Motorized, Steel Wheel 2 Drum Tandem, 10-14 Ton (CCE)		MAKE: HYSTER	MODEL: C350B-D		
MFR PART NO: N/A	NSN: 3845-00-578-0372	SERIAL NO. RANGE: _____ TO _____		DATE: _____	
(1) COMPONENT APPLICATION	(2) MFR PART NO. OR NAT'L STOCK NO.	(3) DESCRIPTION	(4) QTY REQ F/INITIAL OPN	(5) QTY REQ F/8 HRS OPN	(6) NOTE
General Appli- cation	5150-00-190-0905	GAA Grease MIL-G-10924	*	*	50-50 solution
Cooling System	6850-00-181-7933	Anti-Freeze Permanent MIL-A-46153	16 qts.	*	

Maintenance Forms and Records

Every mission begins and ends with the paperwork. There isn't much of it, but you have to keep it up. The forms and records you fill out have several uses. They are a permanent record of the services, repairs, and modifications made on your vehicle. They are reports to organizational maintenance and to your commander. And they are a checklist for you when you want to know what is wrong with the vehicle after its last use, and whether those faults have been fixed. For the information you need on forms and records, see TM 38-750.

Preventive Maintenance Checks and Services

1. Do your before (B) PREVENTIVE MAINTENANCE just before you operate the vehicle. Pay attention to the CAUTIONS and WARNINGS.
2. During checks and services (D) of PREVENTIVE MAINTENANCE will be performed while the equipment and/or its component systems are in operation.
3. Do your after (A) PREVENTIVE MAINTENANCE right after operating the vehicle. Pay attention to the CAUTIONS and WARNINGS.
4. Do your weekly (W) PREVENTIVE MAINTENANCE weekly.
5. Do your monthly (M) PREVENTIVE MAINTENANCE once a month.
6. If something doesn't work, troubleshoot it with the instructions in this manual or notify your supervisor.
7. Always do your PREVENTIVE MAINTENANCE in the same order so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry.
8. If anything looks wrong and you can't fix it, write it on your DA Form 2404. If you find something seriously wrong, report it to organizational maintenance RIGHT NOW.
9. When you do your PREVENTIVE MAINTENANCE, take along the tools you need to do all the checks. You always need a rag or two.

A - Keep it clean: Dirt, grease, oil, and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent (SD-2) on all metal surfaces. Use soap and water when you clean rubber or plastic material.

WARNING

Dry cleaning solvent, used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F - 138°F.

B - Bolts, nuts, and screws: Check them all with a t missing, bent or broken condition. You can't try them all with a t of course, but look for chipped paint, bare metal, or rust around h heads. If you find one you think is loose, tighten it, or report d organizational maintenance if you can't tighten it.

C - Welds: Look for loose or chipped paint, rust, or gaps where pa are welded together. If you find a bad weld, report it to organiza maintenance.

D - Electric wires and connectors: Look for cracked or broken insu bare wires, and loose or broken connectors. Tighten loose connecto and make sure the wires are in good shape.

E - Hoses and fluid lines: Look for wear, damage, and leaks, and m sure clamps and fittings are tight. Wet spots show leaks, of cours But a stain around a fitting or connector can mean a leak. If a le comes from a loose fitting or connector, tighten it. If something broken or worn out, report it to organizational maintenance.

10. It is necessary for you to know how fluid leakage affects the of your vehicle. The following are definitions of the types/class leakage an operator or crew member needs to know to be able to dete the status of his/her vehicle. Learn, then be familiar with them a REMEMBER - WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR!

Leakage Definitions for Crew/Operator PMCS

- | | |
|-----------|--|
| Class I | Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops. |
| Class II | Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected. |
| Class III | Leakage of fluid great enough to form drops that drip from the item being checked/inspected. |

CAUTION

EQUIPMENT OPERATION IS ALLOWABLE WITH MINOR LEAKAGES (CLASS I OR CLASS II) OR COURSE, CONSIDERATION MUST BE GIVEN TO THE FLUID CAPACITY IN THE ITEM/SYSTEM BEING CHECKED/INSPECTED. WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR.

Operator/Crew Preventive Maintenance Checks and Services

B-Before D-During A-After W-Weekly M-Monthly

ITEM TO BE INSPECTED

Procedure: Check for and have repaired, filled, or adjusted as needed

Equipment is n
available if:

Interval

B D A W M

NOTE

PERFORM WEEKLY AS WELL AS BEFORE PMCS'S IF:

- You are the assigned operator but have not operated the equipment since the last weekly.
- You are operating the equipment for the first time.

GENERAL:

- Visually check for loose wiring, damaged piping or hoses.
- Look for evidence of fluid leakage (oil, fuel coolant).

ENGINE CRANK CASE:

Check dipstick for proper level. Add oil as necessary to FULL mark.

RADIATOR:

Check coolant level. Add coolant as required. (Level should be approximately 1 inch from bottom of filler neck).

pint to remove sediment and water.

Class 111 leaks
leakages are fo

B-Before
D-During
A-After
W-Weekly
M-Monthly

ITEM TO BE INSPECTED	Interval				Equipment is not available if:
	B	D	A	M	
<p>Procedure: Check for and have repaired, filled, or adjusted as needed.</p> <p><u>GUIDE ROLL AXLE BEARINGS:</u></p> <p>Lubricate daily with GAA grease. One fitting is located on each end of the guide roll shaft. Apply grease into fitting until movement of old grease around seal is observed.</p> <p><u>STEERING/TRANSMISSION HYDRAULIC RESERVOIR:</u> (Cold check)</p> <p>Check fluid level at sight gauge. Add as required.</p> <p><u>CONTROLS AND INSTRUMENTS:</u> (Check for proper indication and operation)</p> <p>a. <u>Ammeter</u> Slight (+) charge.</p> <p>b. <u>Engine Coolant Temperature Gauge</u> White (warm-up)/Green (normal)/Red (hot)</p> <p>c. <u>Engine Oil Pressure</u> 40-60 PSI normal operation</p> <p>d. <u>Transmission Oil Temperature Gauge</u> Green/Red</p>					Engine coolant, engine pressure and transmission oil temperature gauge abnormal operation.

Item no.	Interval				B-Before	D-During	A-After	W-Weekly	M-Monthly	Equipment available
	B	D	A	M						
8		•			ITEM TO BE INSPECTED Procedure: Check for and have repaired, filled, or adjusted as needed					
9		•			f. <u>Fuel Gauge:</u> g. <u>Controls</u> (i.e. steering, shifting etc.) Check for proper operation. <u>TRANSMISSION SUCTION FILTER:</u> With engine running, check reading on filter gauge. <u>WATER SPRAY SYSTEM/TANK:</u> a. Check strainer and clean with water if required. b. Check water spray nozzle and clean if required. <u>COCO MATS AND SCRAPER BAR:</u> Check for missing or worn mats on scraper bar. *WARNING* Always use extreme caution when repositioning the scraper bars as they are under considerable spring tension and may become sharp when worn. <u>AIR CLEANER:</u> a. Inspect air cleaner element. b. Check air cleaner indicator, if red, clean and service element.					Gauge
10										One o
11										Eleme

ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Q-Quarterly

S-Semiannually

A-Annually

B-Biennially

H-Hours

M-Miles

ITEM NO

INTERVAL

ITEM TO BE INSPECTED

PROCEDURE: Check for and have repaired, filled, or adjusted as need

1.

ENGINE:

Check for leaks, loose mounts and proper operation.

2.

OIL FILTER:

Change oil and filter.

3.

FUEL FILTER AND STRAINER:

Change filter element and strainer element.

4.

V-BELTS: (all belts)

Check tension.

5.

RADIATOR:

a. Check for leaks and clean exterior as required.

b. Check antifreeze protection.

c. Drain and flush radiator and engine.

6.

AIR CLEANER:

a. Check filter element and clean as required.

b. Change filter element.

7.

BLOWER SCREEN:

Clean

ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Q-QUARTERLY S-SEMIANNUALLY A-ANNUALLY B-BIENNIALY H-HOURS MI-MILES

ITEM NO	INTERVAL					ITEM TO BE INSPECTED
	Q	S	A	B	MI	
8.					1000	<p>PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED PERFORM ALL OPERATOR PMCS FIRST</p> <p><u>BATTERY:</u> Check specific gravity of electrolyte in each cell.</p> <p><u>WATER SPRAY SYSTEM:</u> Inspect and clean if required, the tank, strainer and nozzles.</p>
9.			•			
10.			•		1000	<p><u>STEERING/TRANSMISSION HYDRAULIC RESERVOIR:</u> Drain fluid, change filters and refill. (Change both the return filter and suction filter.)</p>
11.			•			<p><u>GAGES AND CONTROLS:</u> Check operation.</p>
12.	•				1000	<p><u>FINAL DRIVE:</u> a. Check fluid level, add as required. b. Drain fluid, flush and refill.</p>

Technical Publication Correction

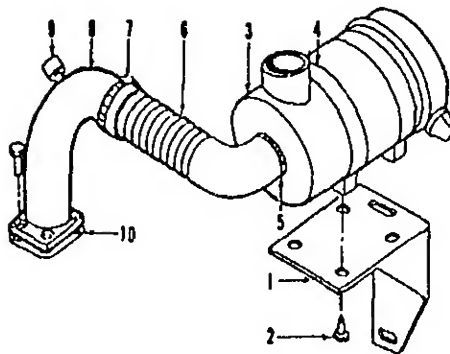
TITLE: C350B Parts Manual

NUMBER: 599352

CONTRACT NUMBER: DSA 700-74-C-9024

Make the following corrections to the publication listed above:

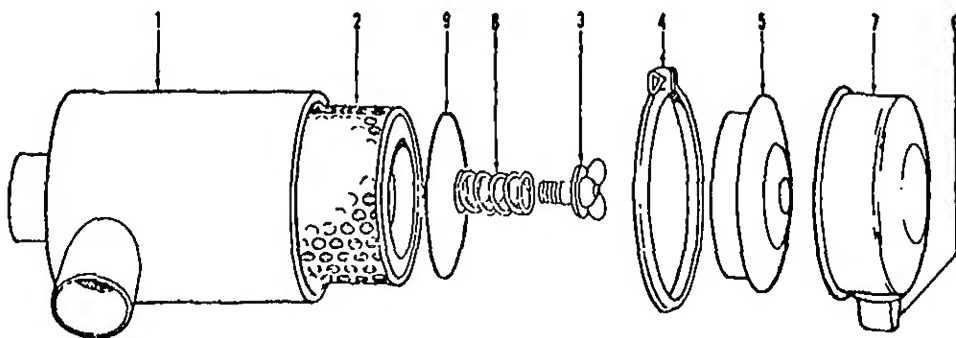
1. Cross out page 1D05 (Air Filters) as it does not apply to this roller.
2. Include attached page 1E04 in your manual.



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
		1 2 3 4	
1	391734	PLATE-AIR CLEANER	1
2	16598	CAPSCREW-3/8 UNC X 7/8	5
2	17428	NUT-3/8 UNC	5
3	182645	FILTER-AIR, SEE 1D08	1
4	138718	BAND-MOUNTING	2
5	78286	CLAMP	1

REF. NO.	HYSTER PART NO.	NAME OF PART
		1 2 3 4
6	391051	HOSE
7	115696	CLAMP
8	169096	TUBE
9	168846	INDICATOR-RESTRICTION
10	170306	GASKET

AIR FILTER



KEY

~~A FOR 3-53 AND 1-53 DIESEL ENGINE.~~

0-FOR 3-53 DIESEL ENGINE ONLY.

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
		1 2 3 4	A B
	182645	FILTER-AIR	1
1	182645	FILTER-AIR	1
	169299	BODY	1
	169299	ELEMENT	1
2	156954	ELEMENT	1
	262287	BOLT	1
3	141266	BOLT	1
4	262287	CLAMP	1

REF. NO.	HYSTER PART NO.	NAME OF PART
		1 2 3 4
4	156958	CLAMP
5	170068	ORFICE
5	156960	BAFFLE
6	141270	VALVE-REGULATOR
7	169299	CLAMP
7	189248	CAP
8	169299	CLAMP
9	156961	O-RING

TITLE: C350B Service Manual
 NUMBER: 7109M
 CONTRACT NUMBER: DSA 700-74-C-9024

Make the following corrections to the publication listed above:

1. Section 2, Table 2-11, page 2-16 entitled BRAKE SYSTEM SPECIFICATIONS. Torque specification on BRAKE SHAFT NUT reads 100 ft-lbs (13.8 Kg-m) and should read 26 ft-lbs (3.6 kg-m) maximum. Please note change in manual.
2. Figure 4-14, page 4-12 and figure 6-4, page 6-4 have been revised to include the horn circuit. The revised figures are attached--please include in the manual.
3. Figure 7-40, page 7-32 shows two (2) arrows pointing to control pressure port. The top (upper most) arrow is incorrect. Cross out the upper most arrow.
4. Figure 7-41, page 7-32 is incorrect. Cross out the entire figure. Case pressure must be checked by tying into the case drain line on top of the hydrostatic pump.
5. Figure 7-44, page 7-35 is incorrect. Cross out entire figure. The revised figure is attached - please include in the manual.
6. Section 7, paragraph 7-172 a, page 7-33 reads a dimension of $13/32$. Please correct copy to read $1 \frac{3}{32}$.
7. Section 7, paragraph c, page 7-35 reads a dimension of $11/16$. Please correct copy to read $1 \frac{1}{16}$.
8. Section 8, figure 8-42, page 8-12 is incorrect. Cross out entire figure. The revised figure is attached - please include in the manual.

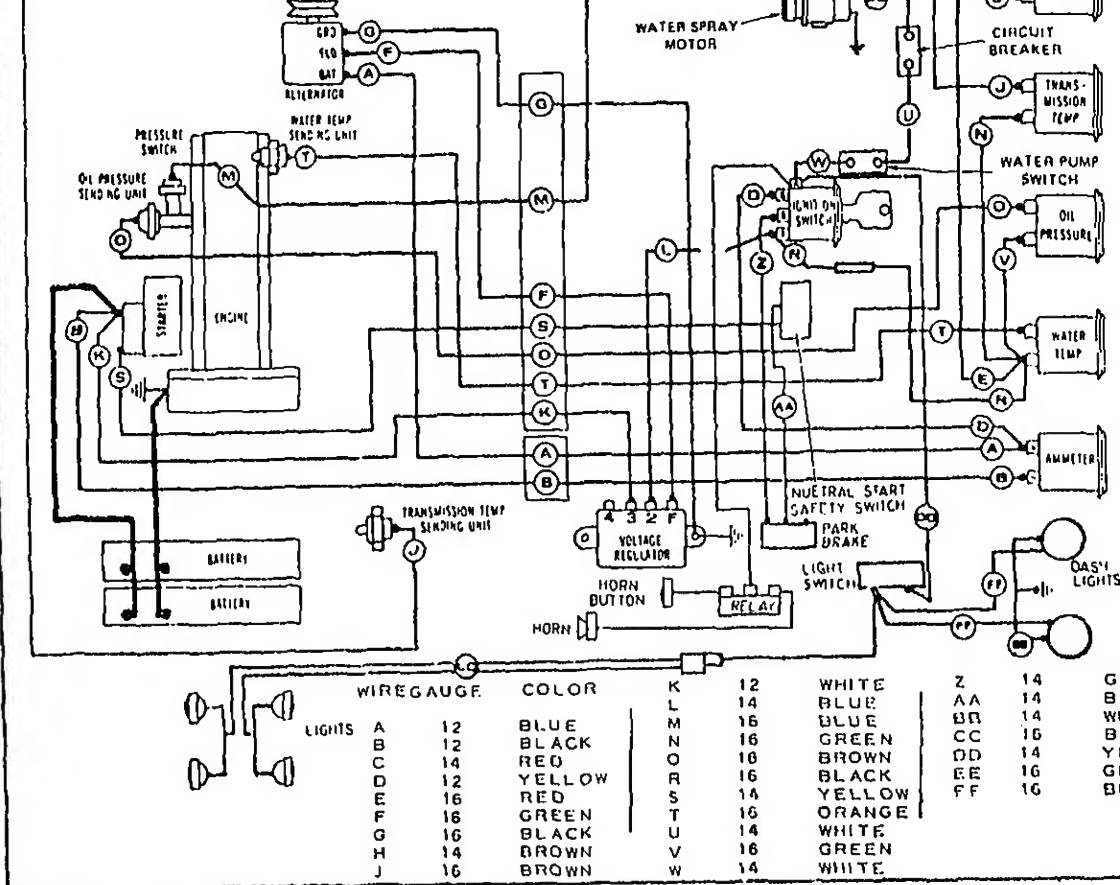
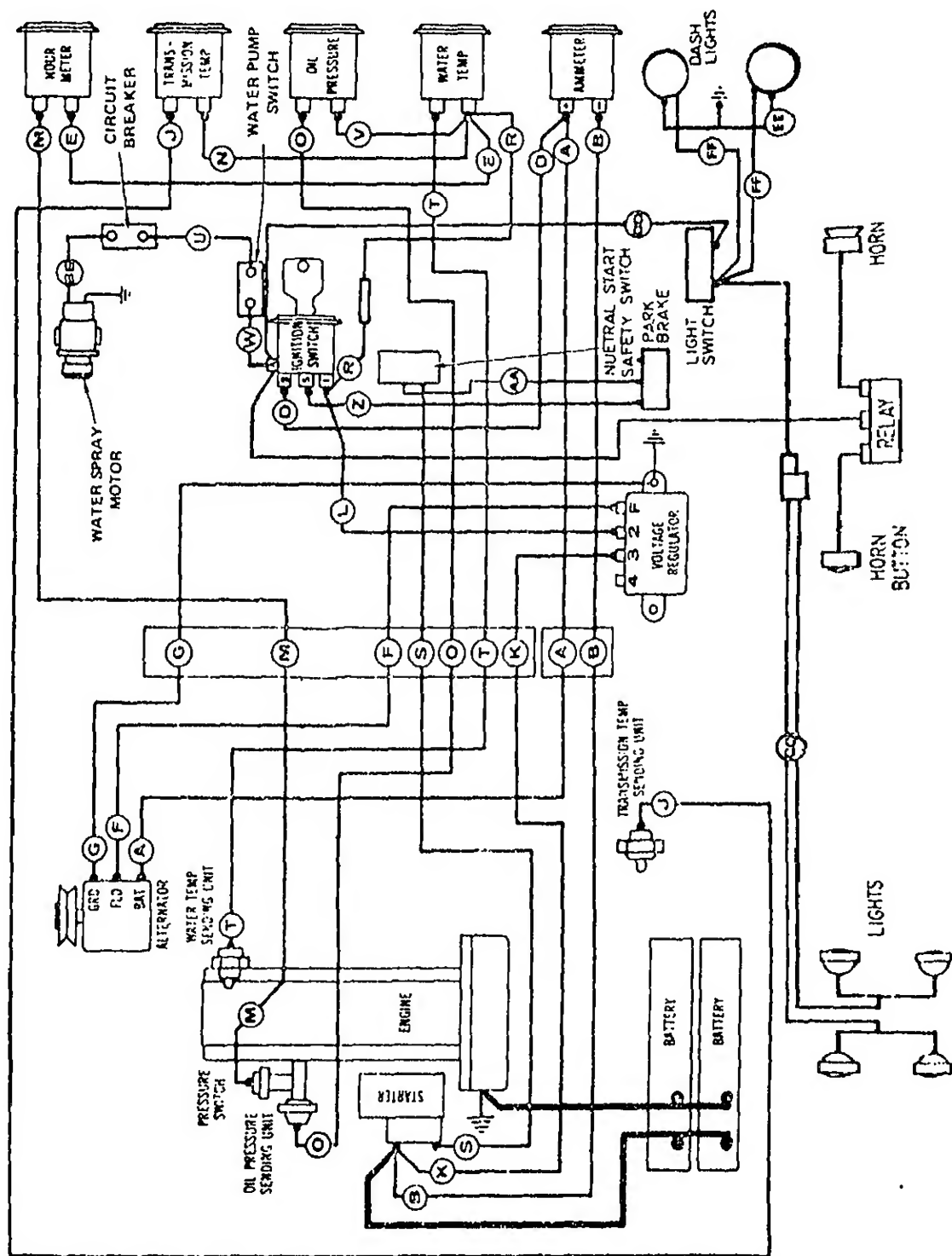


FIGURE 4-14. ELECTRICAL SYSTEM SCHEMATIC (WITH DIESEL ENGINE).



cable at ball shaft end. Adjust neutral start safety (transmission lockout) switch so that it makes contact in neutral.

c. Move Direction-Throttle Control Ball in the forward direction until control cable at servo lever has traveled $11/16 - 31/32$ in. (24.64 - 26.92 mm). Adjust ball stops so that cable cannot be moved beyond this point.

d. Repeat step c in reverse direction.

CAUTION: Ensure that the amount of ball (control cable) travel is limited by ball stops and not the interval servo stops.

e. Return Direction-Throttle Control Ball to neutral (vertical) position.

g. Adjust ball joint in slotted crank on ball shaft to allow full throttle when ball is moved to either full forward or full reverse.

h. Adjust friction control nuts and spring assembly so that Direction-Throttle Control Ball will remain in any desired position.

7-173. THROTTLE CONTROL LINKAGE ADJUSTMENT PROCEDURE (see figure 7-44).

a. Adjust transmission control linkage per procedure outlined in paragraph 7-172 (Sundstrand).

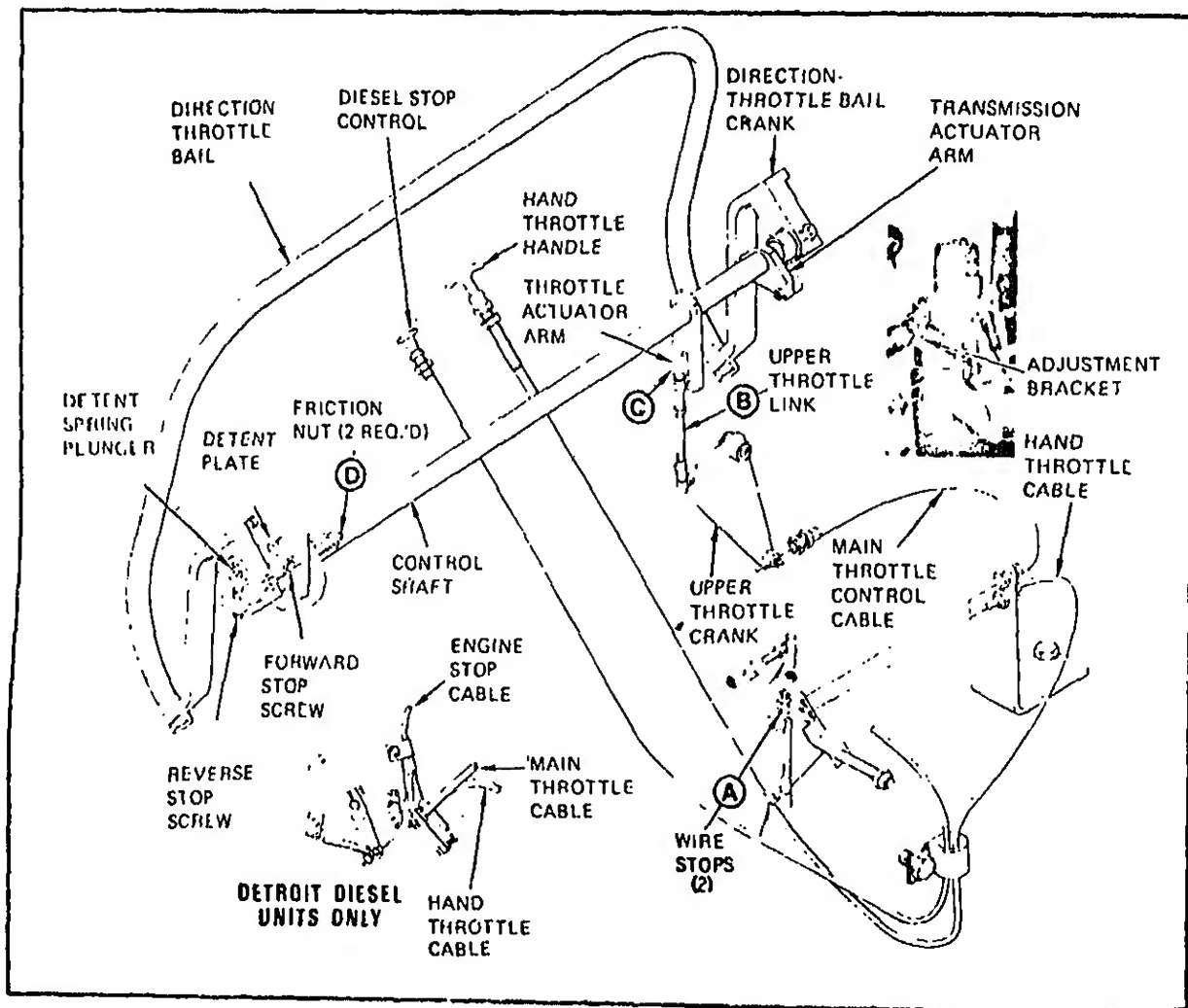


FIGURE 7-44.

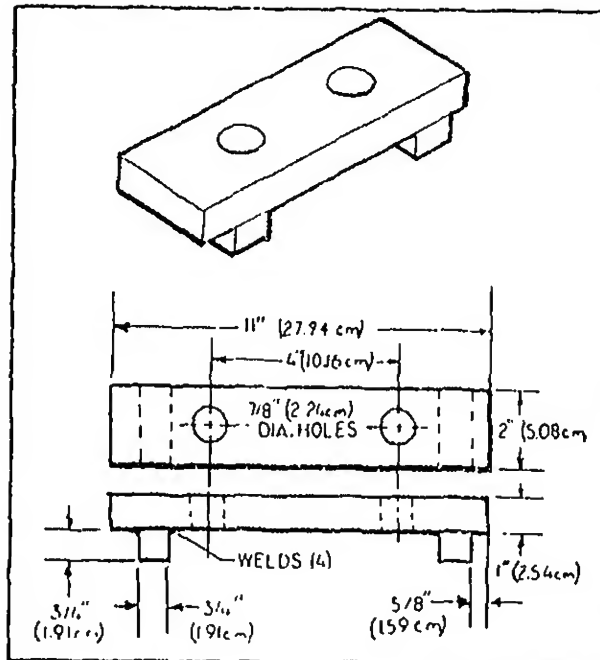
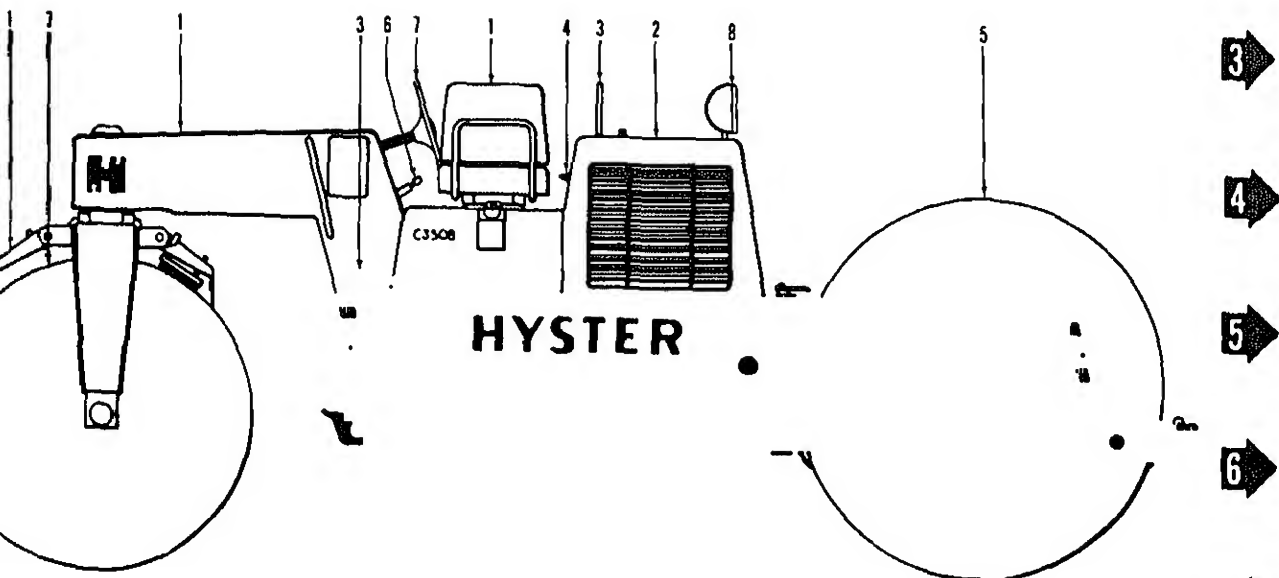


FIGURE 8-42.

STEEL WHEEL ROLLER C350B
CONTRACT NO. DSA 700-74-C-9024



1	FRAME AND BODY PARTS, WATER SPRAY SYSTEM	1A04
2	POWER UNIT	1B02
3	FUEL SYSTEM	1D02
4	ELECTRICAL SYSTEM	1F02
5	TRANSMISSION AND POWER TRAIN	2A04
6	BRAKES AND LINKAGE	2C02
7	STEERING AND LINKAGE	2D02
8	OPTIONAL EQUIPMENT	2E02
9	NUMERICAL INDEX	G02

ALTERNATOR 1F09
 BRAKE AND LINKAGE 2C03
 CARBURETOR 1E04
 CONTROL LINKAGE 2A09
 COOLING SYSTEM 1B09

DECALS AND PAINTING INSTRUCTIONS 1A08
 DISTRIBUTOR 1F04

ELECTRICAL SYSTEM-4-236 AND 3-53 DIESEL 1F05

ENGINE MOUNTS-3-53 DIESEL 1C07

EXHAUST SYSTEM-3-53 DIESEL 1C08

FINAL DRIVE-C350B 2B05

FRAME AND COWLING 1A05

FUEL SYSTEM-3-53 DIESEL

HORN

HYDRAULIC MOTOR

HYDRAULIC PUMP 2A

HYDRAULIC SYSTEM

LIGHTING SYSTEM

OIL FILTER

SCRAPERS AND MATS

SERVO CONTROL VALVE

STEERING CONTROL

STEERING CYLINDER

STEERING PUMP-3-53 DIESEL

STEERING SYSTEM

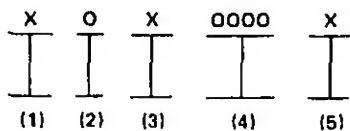
STEERING TRUNNION AND DRUMS

THROTTLE LINKAGE

WATER SPRAY SYSTEM

UNIT IDENTIFICATION

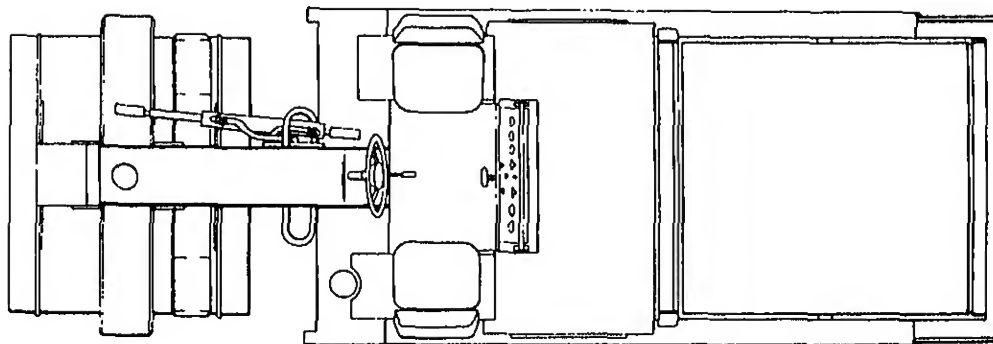
UNIT SERIAL NO.



- (1) & (2) The first letter and number denote the design series and model of the unit.
- (3) The second letter denotes the plant at which the unit was manufactured
- (4) The number series denotes the serial number of the unit
- (5) The final letter denotes the year of manufacture starting with "A" in 1957. The letters "I", "O", and "Q" will not be used

Parts Referred To In This Book As Right Or Left Hand Parts
Are In Accordance With The Illustration Below

R. H. Side

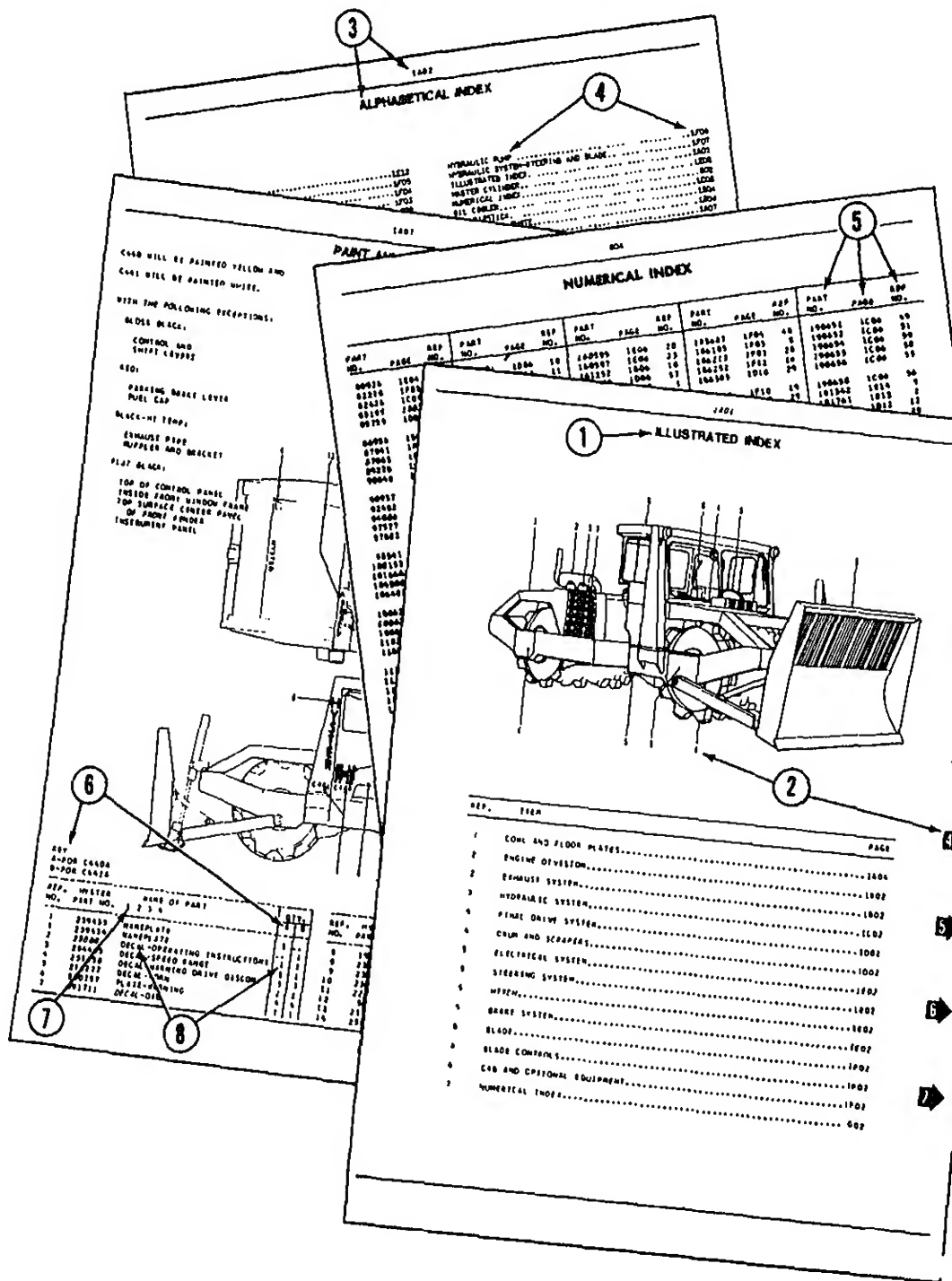


L. H. Side

CAUTION!

Never Attempt To Clean, Oil Or Adjust A Machine
While It Is In Motion

It also includes all parts peculiar to units built in over 1960. These parts are indicated by keys, symbols and



When The Part Number And Next Higher Assembly Is Not

Determine the function and application of the part required. Turn to the illustrated index page immediately following the front cover, and select the most appropriate area.

Follow the black arrow containing the appropriate reference number, with the black tab on the division index page with the same reference number. Use the division index to determine the assembly which would normally contain the part required. Proceed then to locate the part on the assembly breakdown page.

When The Part Number Is Not Known And Next Higher Assembly Is Known:

Determine the assembly the required part is used on. Turn to the alphabetical index immediately following the illustrated index.

Follow the assembly the required part is used on and turn to the page indicated for that assembly. Proceed then to locate the part on the assembly breakdown page.

When The Part Number Is Known:

5. Use the numerical index to find the part number. Turn to the page listed and locate the part as indicated by the reference number.

GENERAL: The assembly breakdowns include part numbers, description, quantities required, keys and footnotes to help in selecting the correct parts.

6. Keys are used to show effective serial numbers, two or more similar assemblies, RH and LH assembly parts, etc. Select the appropriate key, "A", "B", "C" or "D" and the corresponding quantity column to find the required part.

7. Indent numbers are used to indicate assemblies and sub-parts of assemblies. Number 1 is the major assembly. Part descriptions which are indented under 2, 3, or 4 are sub-parts of that major assembly shown above.

8. Quantities shown are for one assembly. Note that three assemblies are shown, but the quantities of the sub parts are indicated as one and two. This means one and two per assembly.

ORDERING PARTS: When ordering replacement parts, give the unit serial number, part number, name of part and quantity required.

For any further information on parts, service, or ordering, consult your local Hyster dealer.

FIRE PRECAUTION

To avoid fires, operators should be instructed to refuel compactors in well lighted areas outside of buildings. Repairs and adjustments should be made on only those compactors which have been taken to a garage or maintenance shop.

STORAGE OF COMPACTOR

Lubricate the compactor according to lubrication recommendations if it is to be left standing for any length of time. This will protect against rusting.

The engine should be run once a week until it is thoroughly warm. This will circulate the oil and prevent rusting from condensation, in addition to keeping the battery charged.

If freezing weather is expected before the engine will be started again, see that the cooling system is adequately protected against freezing. Drain all water ballast from drums, or use calcium chloride solution.

If the engine is to be stored or left standing longer than a normal day, fill the fuel tank with clean fuel to keep out moisture laden air. This will prevent condensation and rust from forming inside the tank.

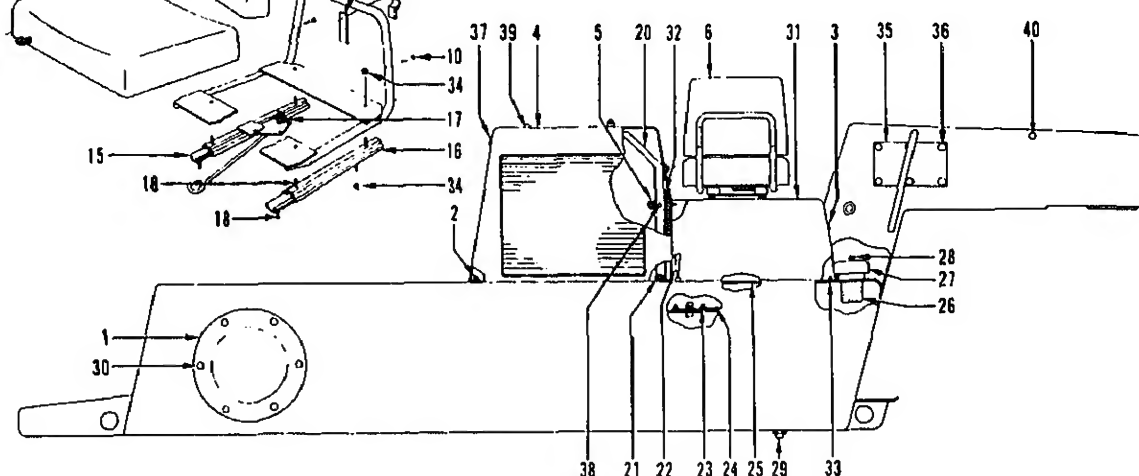
OPERATION AND MAINTENANCE TIPS

The following tips will help increase compactor life and contribute to the reduction of expensive downtime.

1. Check lubricating and hydraulic oils and engine coolant at the beginning of each work shift. Use only recommended oils.
2. Don't work compactor until engine and hydraulic oils are warm.
3. Don't let engine idle for extended periods.
4. Don't operate compactor with faulty engine governor or with excessive hydraulic pressure. Have qualified personnel make these checks.
5. Make sure the air cleaner and oil filters are serviced correctly. All connections must be tight with no leaks in the system.
6. Do not add coolant to an overheated engine.
7. After working compactor let engine idle a few minutes before stopping.
8. Fill fuel tank at the end of the shift, when compactor is warm.
9. Repair minor defects immediately.
10. Adhere to lubrication and maintenance recommendations.

FRAME AND BODY PARTS, WATER SPRAY SYSTEM

DECALS AND PAINTING INSTRUCTIONS	1A08
FRAME AND COWLING	1A05
SCRAPERS AND MATS	1A06
WATER SPRAY SYSTEM	1A07



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1 2 3 4			
1	390723	PLATE COVER	1
1	393083	PLATE-COVER, RH	1
1	390723	PLATE-COVER, LH	1
2	15056	NUT-3/8 UNC	4
2	15134	WASHER-3/8	4
2	15156	LOCKWASHER-3/8	4
3	158452	BUMPER-GROMMET TYPE	2
4	189288	COWL-GAS	1
4	189287	COWL-3-53 DIESEL	1
4	391373	COWL-3-53 DIESEL	1
4	189284	COWL-3-53 DIESEL	1
5	164524	EYEBOLT-5/16 UNC	1
5	95875	SPRING	1
5	18515	WASHER-5/16	2
5	145639	LOCKNUT-5/16 UNC	1
6	109983	A SEAT	2
7	233157	CUSHION-BACK	1
7	136112	COVER	1
8	233155	FRAME	1
9	233156	CUSHION-SEAT	1
9	136111	COVER	1
10	148260	SCREW	4
12	164065	KIT-BRACKET	2
13	.....	WASHER-1/4	4
14	16709	SCREW-1/4 UNC X 3/4	4
15	204120	ADJUSTER-WITH LATCH	2
16	204121	ADJUSTER-WITHOUT LATCH	2
17	233163	SPRING-LATCH	1
18	203920	STUD	8
20	391061	PANEL-INSTRUMENT	1
20	391340	PANEL-INSTRUMENT	1
20	391612	PANEL-INSTRUMENT	1
20	261162	TAPE-SPONGE RUBBER, BULK	1
20	261158	TAPE-SPONGE RUBBER, BULK	1
21	15058	NUT-1/2 UNC	2
21	15156	LOCKWASHER-1/2	2
22	* 177989	LATCH	2
22	* 15687	CAPSCREW-1/4 UNC X 1 1/2	2
22	* 177991	BRACKET-ANCHOR	2
22	* 221341	LOCKNUT-1/4 UNC	2
23	156133	LOCKNUT-3/8 UNC	12
24	184814	COVER-WATER TANK	1
24	158445	GASKET	1
25	158447	PLATE-FLOOR	1
26	184819	STRAINER	1
26	184818	SNAP RING	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1 2 3 4			
27	87393	CAP-FILLER, WATER	
28	21420	PLUG-BREATHING	
29	15310	PLUG	
30	16597	CAPSCREW-3/8 UNC X 3/4 G5	
30	15156	LOCKWASHER-3/8	
31	158439	HOOD	
32	189303	GUARD-VANDALISM, GAS AND	
32		3-53 DIESEL	
32	189648	GUARD-VANDALISM, 3-53 DIESEL	
32	15055	NUT-5/16 UNC	
32	18515	WASHER-5/16	
32	15155	LOCKWASHER-5/16	
32	16597	CAPSCREW-3/8 UNC X 3/4 G5	
32	15156	LOCKWASHER-3/8	
33	15055	NUT-5/16 UNC	
33	18515	WASHER-5/16	
33	15155	LOCKWASHER	
34	15005	NUT-5/16 UNC	
34	16775	LOCKWASHER-5/16	
34	15175	WASHER-5/16	
35	158449	PLATE-COVER	
36	15056	NUT-3/8 UNC	
36	15156	LOCKWASHER-3/8	
37	181859	BUMPER	
37	15002	NUT-#10 UNF	
37	15152	LOCKWASHER-3/16	
38	16634	CAPSCREW-3/8 UNF X 1 G5	
38	15006	NUT-3/8 UNF	
38	15156	LOCKWASHER-3/8	
38	16818	CAPSCREW-5/16 UNF X 3/4 G5	
38	15155	LOCKWASHER-5/16	
38	18515	WASHER-5/16	
38	15005	NUT-5/16 UNF	
39	166296	PLUG	
40	170686	PLUG	

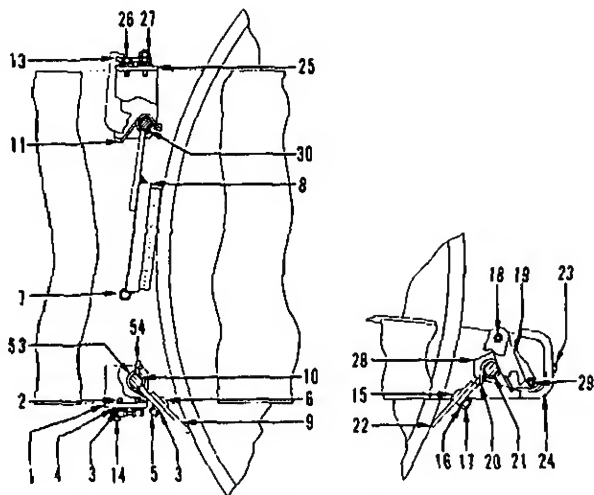
*INCLUDED IN LATCH KIT 180313.

□LAST USED ON SERIAL NO. A146C-1535 AND B89C-3239.

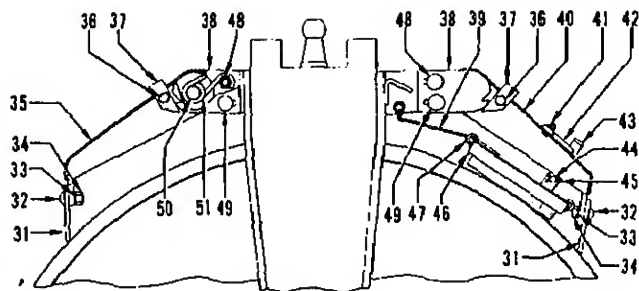
■FIRST USED ON SERIAL NO. A146C-1536 AND B89C-3240. A146C-1539 USES PANEL 3910

■FIRST USED ON SERIAL NO. A146C-1546 AND B89C-3300.

■FIRST USED ON SERIAL NO. A146C-1700 AND B89C-3401.



FOR DRIVE DRUM

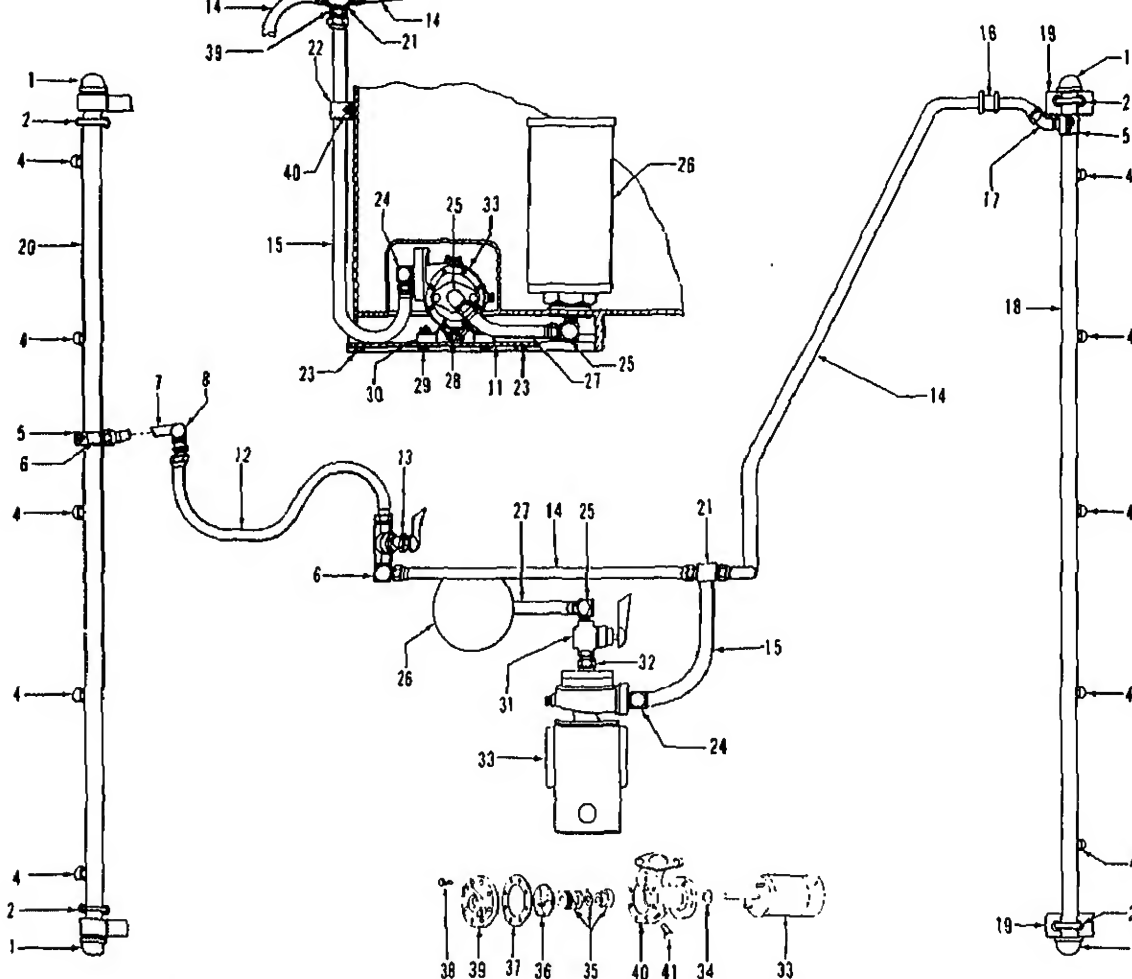


FOR STEERING DRUM

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1 2 3 4			
1	169694	BRACKET-LH	1
1	157325	BRACKET-RH	1
2	16830	CAPSCREW-1/2 UNC X 1 1/4 G5	4
3	15158	LOCKWASHER-1/2	6
4	15135	WASHER-1/2	8
5	15058	NUT-1/2 UNC	2
6	18588	BOLT-1/3 UNC X 1-1/4	2
7	89469	COTTER	16
8	157321	MAT	1
9	157315	PLATE-SCRAPER	1
10	169695	SHAFT	1
11	169698	SPRING-RH	1
13	157314	HOOK	2
14	16691	CAPSCREW-5/16 UNF X 7/8 G5	1
14	18515	WASHER-5/16	2
14	15025	NUT-5/16 UNF	1
15	18588	BOLT-1/2 UNC X 1-1/4	2
16	15158	LOCKWASHER-1/2	2
17	15058	NUT-1/2 UNC	2
18	16634	CAPSCREW-3/8 UNF X 1 G5	1
18	15006	NUT-3/8 UNF	1
19	157343	PLATE-LOCKING	1
20	169697	SPRING-RH	1
20	169698	SPRING-LH	1
21	169699	SHAFT	1
22	157315	PLATE-SCRAPPER	1
23	16085	CAPSCREW-1/2 UNC X 1 3/4 G5	4
23	15158	LOCKWASHER-1/2	4
23	15058	NUT-1/2 UNC	4
24	157335	BUMPER	1
25	184335	BRACKET-LH	1
25	184337	BRACKET-RH	1
26	16830	CAPSCREW-1/2 UNC X 1 1/4 G5	4
26	15135	WASHER-1/2	4
26	15158	LOCKWASHER-1/2	4
27	16825	CAPSCREW-5/16 UNF X 1 G5	1
27	18515	WASHER-5/16	2
27	15005	NUT-5/16 UNF	1
28	157342	PLATE	1
29	16830	CAPSCREW-1/2 UNC X 1 1/4 G5	2
29	15158	LOCKWASHER-1/2	2

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1 2 3 4			
29	15058	NUT-1/2 UNC	2
30	170551	BRACKET-MAT	1
30	157315	BRACKET-MAT	1
31	157315	PLATE-SCRAPPER	2
31	157315	PLATE-SCRAPER	2
32	18588	BOLT-1/2 UNC X 1-1/4	4
33	15158	LOCKWASHER-1/2	4
34	15058	NUT-1/2 UNC	4
35	157305	BRACKET-SCRAPER	1
36	18202	CAPSCREW-SPECIAL	2
36	15026	NUT-3/8 UNF	2
37	157322	PAWL-RATCHET	2
38	157302	BRACKET-LH	2
38	157303	BRACKET-RH	2
38	157303	BRACKET-RH	2
39	184331	BRACKET-MAT	1
40	157309	BRACKET-SCRAPER	1
41	18497	CAPSCREW-5/16 UNC X 3/4	1
41	18515	WASHER-5/16	1
41	15114	NUT-1/2 UNC	1
42	157314	PLATE	1
43	157318	PLATE	1
44	142	PLATE	1
45	15212	PLATE	1
46	15732	PLATE	1
46	15732	PLATE	1
47	8946	PLATE	1
48	18590	PLATE	1
48	15158	LOCKWASHER-1/2	1
48	15058	NUT-1/2 UNC	1
48	67326	NUT-1/2 UNC	1
49	18588	BOLT-1/2 UNC X 1-1/2	6
49	15158	LOCKWASHER-1/2	6
49	15058	NUT-1/2 UNC	6
50	157313	SHAFT	2
50	58933	SNAP RING	2
51	157312	SPRING	2
53	169698	SPRING-RH	1
53	169697	SPRING-LH	1
54	19936	ROLL PIN-5/16 X 3 3/4	1

USED ON G240A ONLY

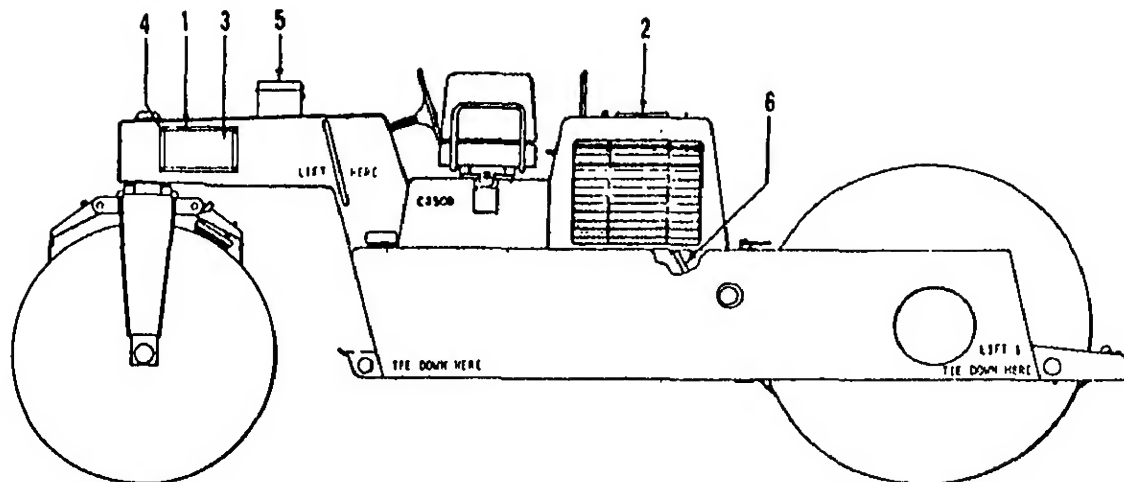


REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	2	3	4
1	15373	CAP-PIPE	2
2	184313	U-BOLT	4
2	15154	LOCKWASHER-1/4	8
4	199400	NOZZLE-SPRAY	10
5	184317	CONNECTOR	2
6	69240	ELBOW	1
6	14546	ELBOW	1
7	116486	HOSE	1
8	16457	ELBOW	1
11	184321	PLATE	1
12	169708	HOSE	1
13	169693	VALVE	1
14	153685	HOSE	2
15	184320	TUBE	1
16	115983	GROMMET	1
17	14546	ELBOW	1
18	390016	PIPE-MANIFOLD	1
19	184327	PLATE	2
20	199398	PIPE-MANIFOLD	1
21	14652	TEE	1
22	136516	CLAMP-HOSE	1
23	18535	CAPSCREW-3/8 UNC X 5/8 G5	4
23	15156	LOCKWASHER-3/8	4
24	17306	ELBOW	1
25	17309	ELBOW	2
26	199401	FILTER-SUMP	1

REF. NO.	HYSTER PART NO.	NAME OF PART
1	2	3
27	192335	HOSE
28	15329	PLUG-DRAIN
29	18466	CAPSCREW-1/4 UNC X 1 1/4 G5
29	15054	NUT-1/4 UNC
29	15154	LOCKWASHER-1/4
30	184322	BLOCK-SUPPORT
31	184324	VALVE
32	16116	BUSHING
33	184325	PUMP AND MOTOR
33	196281	MOTOR
33	197861	CAP-BRUSH
33	197862	BRUSH AND SPRING
34	196431	SLINGER
35	196284	SEAL
36	196283	IMPELLER
37	196286	GASKET
38	196285	SCREW AND WASHER
39	249292	COVER
40	249291	BODY-PUMP
41	15329	PLUG-DRAIN
42	14678	CONNECTOR
43	15056	NUT-3/8 UNC
43	15156	LOCKWASHER-3/8

USED ON 09508

USED ON 09104



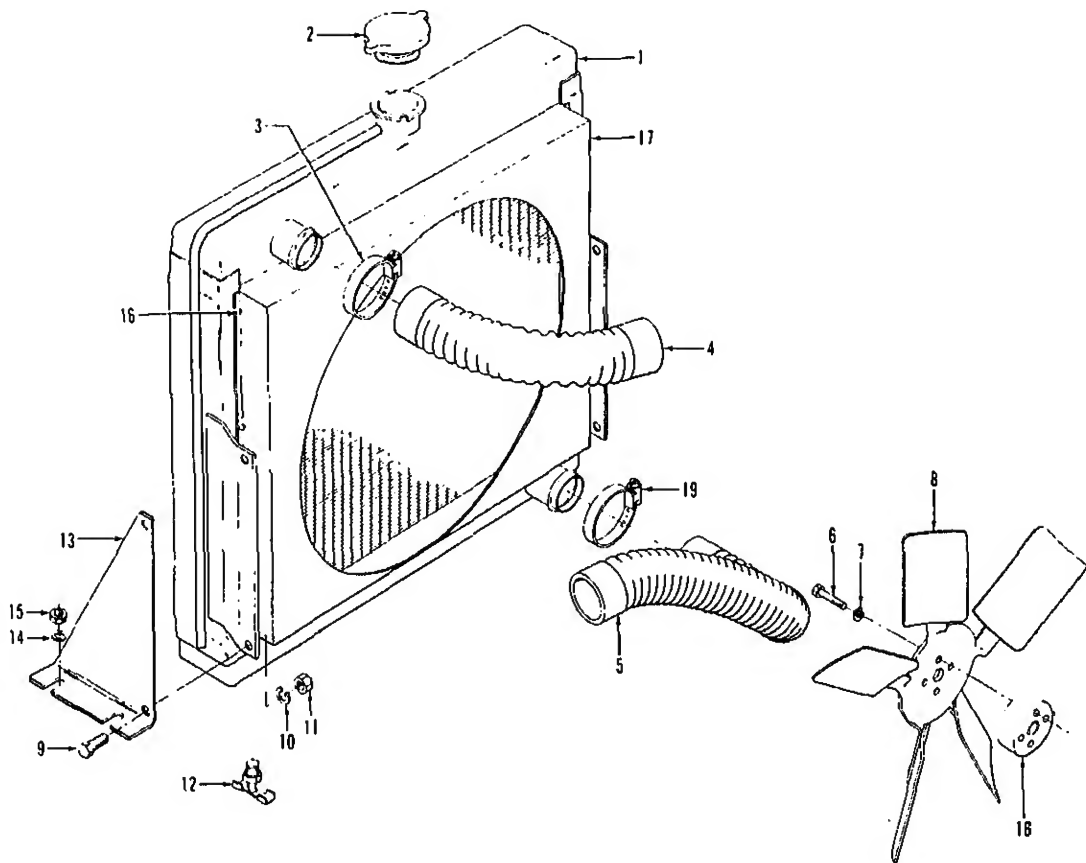
REF.	HYSTER	NAME OF PART				QTY.
NO.	PART NO.	1	2	3	4	
393321		PLATE-COVER				1
393320		PLATE-COVER				1
393317		DECAL-NOISE				1
393316		DECAL				1
222031		RIVET				8
393562		TOOL BOX				1

REF.	HYSTER	NAME OF PART				QTY.
NO.	PART NO.	1	2	3	4	
5	15155	WASHER-5/16				4
5	10515	WASHER-5/16				4
5	16836	CAPSCREW-5/16 UNC X 3/4				4
6	168710	CLAMP				1
6	193772	HOSE-CRANKCASE VENT				1
	393563	PAINT-MILITARY GREEN				AR

NOTE-FOR SERVICE OF THIS ENGINE, SEE YOUR DETROIT DIESEL
MANUAL AND CONTACT YOUR LOCAL DETROIT DEALER.

POWER UNIT

CAMSHAFT GAS	1803
CAMSHAFT 4-236 DSL	1603
COOLING SYSTEM	1809
CRANKSHAFT GAS	1803
CRANKSHAFT 4-236 DSL	1602
CYLINDER BLOCK GAS	1803
CYLINDER BLOCK 4-236 DSL	1812
CYLINDER HEAD GAS	1805
CYLINDER HEAD 4-236 DSL	1813
CYLINDER HEAD COVER GAS	1805
CYLINDER HEAD COVER 4-236 DSL	1601
ENGINE MOUNTS GAS	1807
ENGINE MOUNTS 4-236 DSL	1814
ENGINE MOUNTS-3-53 DSL	1607
EXHAUST SYSTEM GAS	1808
EXHAUST SYSTEM 4-236 DSL	1608
EXHAUST SYSTEM-3-53 DSL	1608
MANIFOLDS GAS	1805
MANIFOLDS 4-236 DSL	1813-1814
OIL FILTER GAS	1805
OIL FILTER 4-236 DSL	1605
OIL PUMP GAS	1808
OIL PUMP 4-236 DSL	1604
TIMING GEAR GAS	1803
TIMING GEAR 4-236 DSL	1603
WATER PUMP GAS	1805
WATER PUMP 4-236 DSL	1605



KEY

A FOR GAS ENGINE.
 B FOR 4-236 DIESEL ENGINE.
 C FOR 3-53 DIESEL ENGINE.

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.			
			1	2	3	4
1	100445	RADIATOR				
1	165202	RADIATOR				
1	169105	RADIATOR				
2	106483	CAP-RADIATOR				
3	119236	CLAMP				
4	390325	HOSE-COOLANT				
4	390325	HOSE-COOLANT				
4	100434	HOSE-RADIATOR				
5	155467	HOSE-RADIATOR				
5	110667	HOSE-RADIATOR				
5	169107	HOSE-RADIATOR				
5	164134	TUBE				
5	146444	HOSE-RADIATOR				
6	10611	CAPSCREW-5/16 UNC X 3 CS				
6	16663	GPSCR-5/16 UNC X 5/8 CS				
6	16499	CAPSCREW				
7	15155	LOCKWASHER-5/16				
8	147340	FAN				
8	106155	FAN				
9	16805	CAPSCREW-3/8 UNC X 1				
9	17262	CAPSCREW-7/16 UNC X 5/8				
10	15156	LOCKWASHER-3/8				

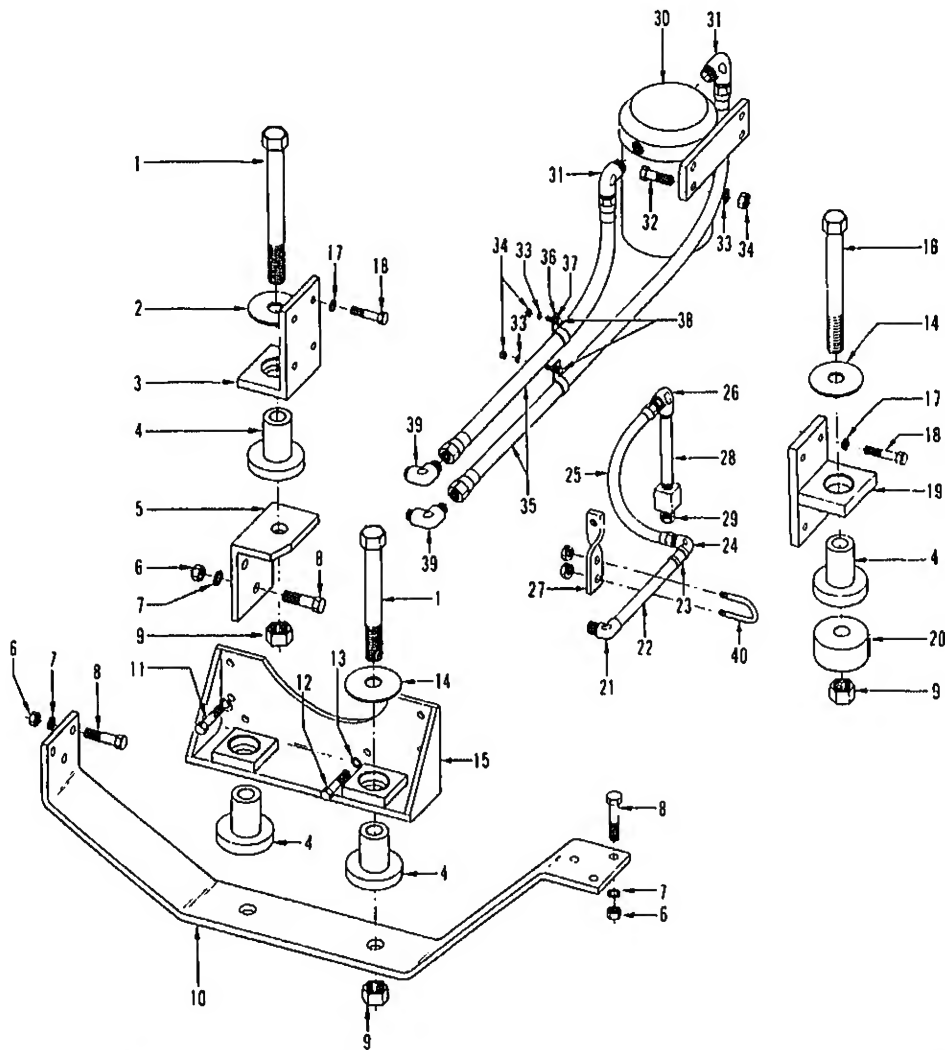
REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.			
			1	2	3	4
11	15057	NUT-7/16 UNC				
12	12815	COCK-DRAIN				
13	157364	BRACKET-RADIATOR				
13	190519	BRACKET-RADIATOR				
14	15134	WASHER-3/8				
15	145641	NUT-3/8 UNC				
16	134102	SCREW				
16	16719	SCREW-#8 UNC X 3/8				
16	15163	LOCKWASHER-#8				
17	161145	SHROUD				
17	190520	SHROUD				
17	101104	SHROUD				
17	391369	SHROUD				
18	160827	SPACER				
18	161537	SPACER				
19	112989	CLAMP-HOSE				
19	119336	CLAMP-HOSE				

FIRST USED ON SERIAL NO. A140C-1546

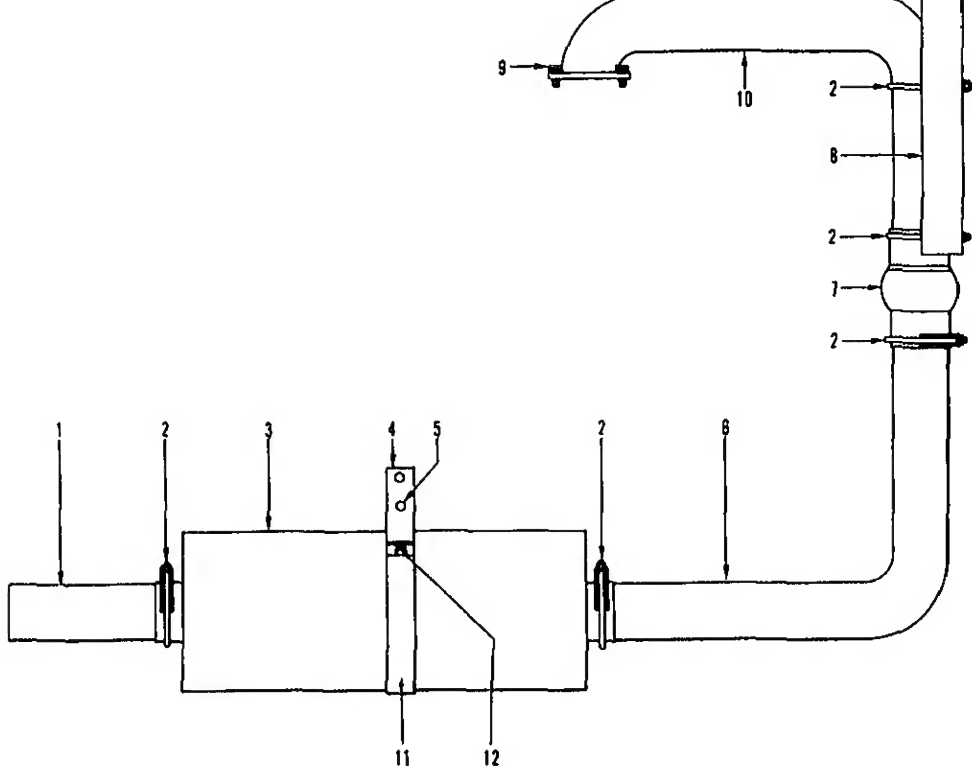
AND 0096-3500

FIRST USED ON SERIAL NO. 0096-3202

FOR 3-53 DIESEL ENGINE



HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
12948	CAPSCREW-5/8 UNF X 3 G5	3	23	15461	COUPLING	1
21162	WASHER-5/8	1	24	17300	ELBOW	1
168836	BRACKET	1	25	99443	HOSE-HYDRAULIC	1
164280	MOUNT-ENGINE	4	26	14526	ELBOW	1
168835	ANGLE	1	27	191782	BRACKET	1
15012	NUT-3/4 UNF	9	28	198881	PIPE	1
15162	LOCKWASHER-3/4	9	29	14386	PLUG-3/8	1
16800	CAPSCREW-3/4 UNF X 2 G5	9	30	.....	OIL FILTER-COMES WITH ENGINE	1
17405	LOCKNUT-5/8 UNF	4	31	17301	ELBOW	2
168830	BRACKET	1	31	16275	PLUG	2
18543	CAPSCREW-3/8 UNF X 3 3/4 G5	4	32	16828	CAPSCREW-3/8 UNC X 1 1/4 G5	4
15156	LOCKWASHER-3/8	4	33	15156	LOCKWASHER-3/8	6
18557	CAPSCREW-7/16 UNC X 1 1/4 G5	2	34	15056	NUT-3/8 UNC	6
15157	LOCKWASHER-7/16	2	35	76787	HOSE-HYDRAULIC	2
164281	WASHER-5/8	3	36	113687	CLAMP	2
205127	BRACKET	1	37	15176	WASHER-3/8	2
12481	CAPSCREW-5/8 UNF X 4 1/2 G5	1	38	16805	CAPSCREW-3/8 UNC X 1 G5	2
15158	LOCKWASHER-1/2	8	39	17307	ELBOW	2
16830	CAPSCREW-1/2 UNC X 1 1/4 G5	8	40	184313	U-BOLT	1
168838	BRACKET	1				

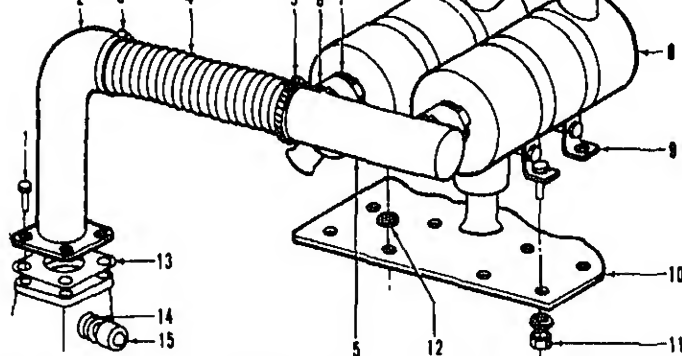


REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
		1 2 3 4	
1	169116	TAILPIPE	1
2	30375	CLAMP	6
3	153025	MUFFLER	1
4	192208	STRIP	1
5	16828	CAPSCREW-3/8 UNC X 1 1/4 G5	2
5	15156	LOCKWASHER-3/8	2
5	15056	NUT-3/8 UNC	2
6	169112	PIPE	1
7	169115	SWIVEL-EXHAUST	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
		1 2 3 4	
8	169114	SHIELD-HEAT	1
9	16805	CAPSCREW-3/8 UNC X 1 G5	4
9	15156	LOCKWASHER-3/8	4
9	15176	WASHER-3/8	4
10	169109	PIPE-EXHAUST	1
11	192205	STRIP-FORMED	2
12	15529	CAPSCREW-3/8 UNC X 1	2
12	15156	LOCKWASHER-3/8	2
12	15056	NUT-3/8 UNC	2

FUEL SYSTEM

AIR FILTER-GAS	1004
AIR FILTER-4-236 DSL	1004
AIR FILTER-3-53 DSL	1E04
CARBURETOR	1E04
FUEL INJECTION PUMP-4-236 DSL	1013
FUEL INJECTION SYSTEM-4-236 DSL	1012
FUEL OIL LIFT PUMP-4-236 DSL	1E01
FUEL PUMP-GAS	1003
FUEL SYSTEM-GAS	1003
FUEL SYSTEM-4-236 DSL	1011
FUEL SYSTEM-3-53 DSL	1E03
GOVERNOR	1003
SECONDARY FUEL FILTER-4-236 DSL	1E01
SECONDARY FUEL FILTER-3-53 DSL	1E03
THROTTLE LINKAGE	1007



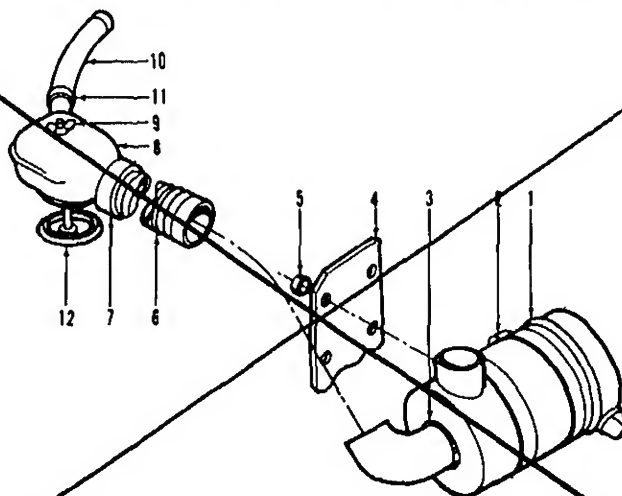
REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
1	18497	CAPSCREW-5/16 UNC X 1	4
1	15155	LOCKWASHER-5/16	4
2	169092	TUBE-AIR INLET	1
3	115696	CLAMP-HOSE	2
4	169095	HOSE	1
5	169100	MANIFOLD-AIR CLEANER	1
6	169098	HOSE	2
7	112989	CLAMP	4
8	169096	AIR CLEANER	2
8	234718	BAR-RETAINER	1
8	234719	ELEMENT	1
8	138253	UNLOADER	1

REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4
8	130845	CLAMP
9	169099	BRACKET-AIR CLEANER
10	168843	BRACKET-MOUNTING
11	16691	CAPSCREW-5/16 UNF X 7/8
11	15155	LOCKWASHER-5/16
11	15005	NUT-5/16 UNF
12	16374	CAPSCREW-5/16 UNC X 5/8
12	15155	LOCKWASHER-5/16
13	170306	GASKET
14	16187	BUSHING
15	168846	RESTRICTION INDICATOR KIT

AIR FILTER

FOR GAS ENGINE

FIRST USED ON SERIAL NO. 889C-3300 AND A146C-1546

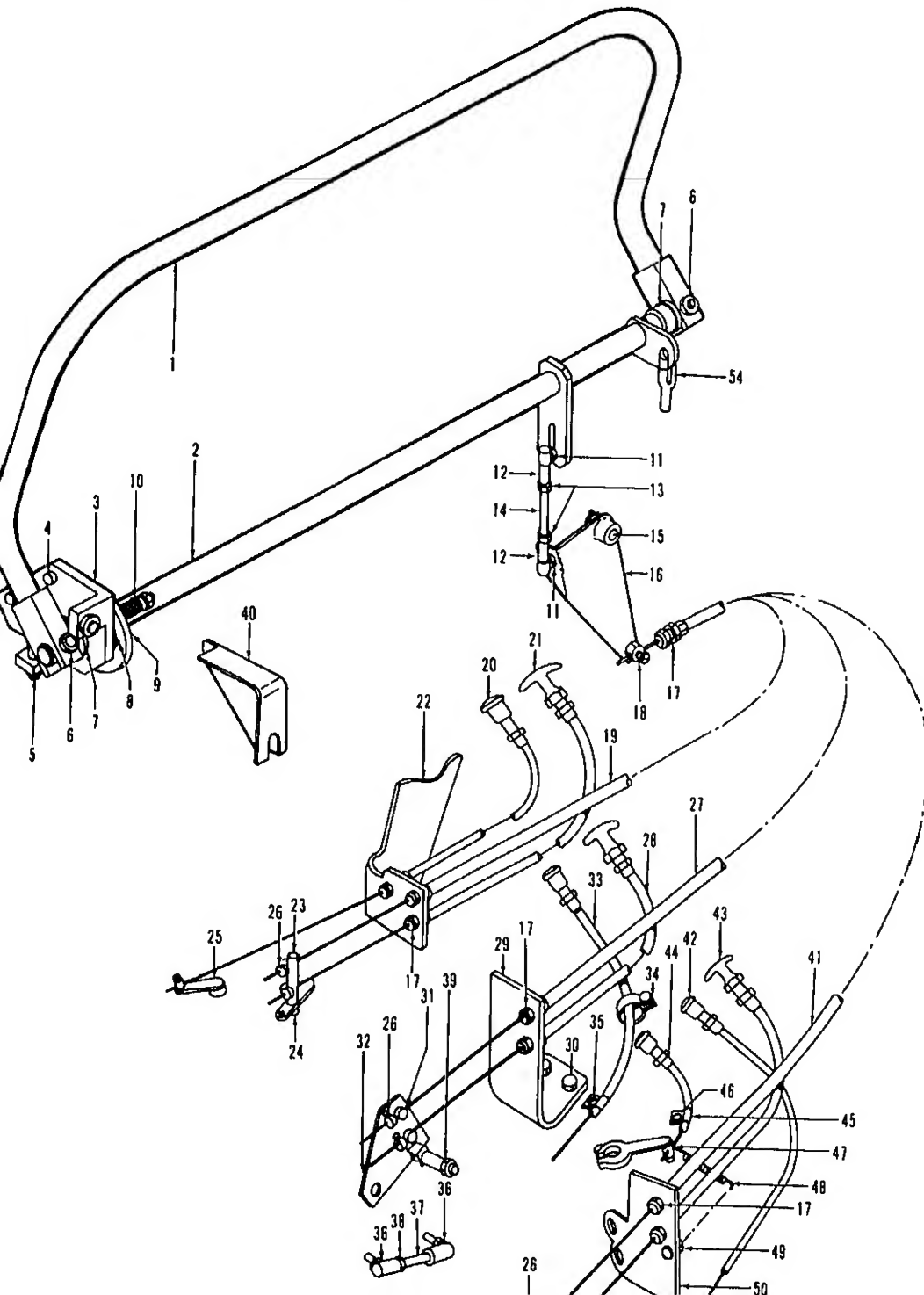


REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
1	223137	AIR CLEANER-SEE 1008	1
2	169428	BRACKET-AIR CLEANER	2
3	115696	CLAMP	1
4	391053	PLATE-SUPPORT	1
5	16828	CAPSCREW-3/8 UNC X 1 1/4	4
5	17428	NUT-3/8 UNC	4
6	390370	HOSE	1
7	112989	CLAMP	1

REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4
8	157116	ELBOW
9	17443	WING NUT-5/16 UNC
9	183586	WASHER-SEALING
9	164222	LINK
9	145639	LOCKNUT
10	163730	HOSE
11	127045	CLAMP-HOSE
12	181329	GASKET

THROTTLE LINKAGE

FIRST USED ON SERIAL NO. 889C-3401 AND A146C-1700



KEY

~~A- FOR 1-236 DIESEL ENGINE.~~~~B- FOR 049 ENGINE.~~

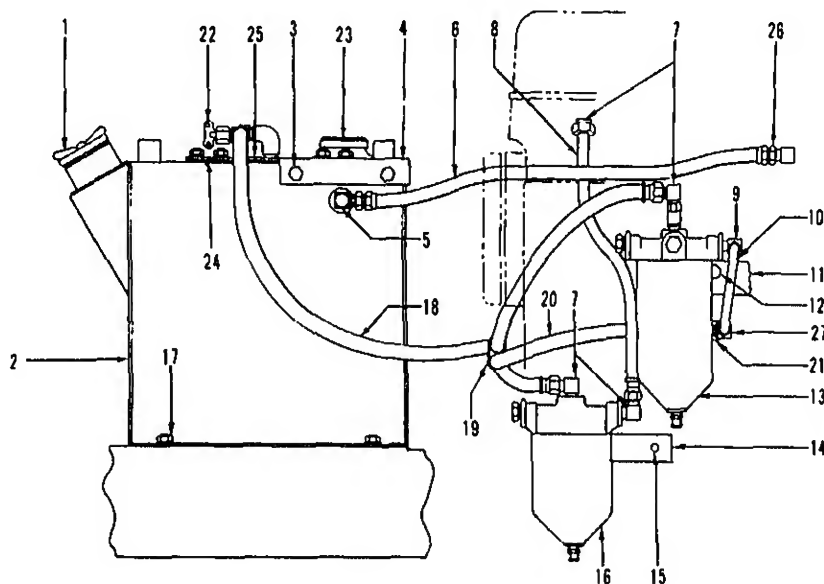
C- FOR 3-53 DIESEL ENGINE.

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	C
		1 2 3 4		
1	391649	LEVER	1	1
2	391569	SHAFT	1	1
3	391729	SUPPORT-L.H.	1	1
4	16598	CAPSCREW-3/8 UNC X 7/8	2	2
4	15156	WASHER-3/8	2	2
5	16215	CAPSCREW-3/8 UNC X 1	2	2
5	15086	NUT-3/8 UNC	2	2
6	16816	CAPSCREW-3/8 UNC X 1 3/4	2	2
6	15156	WASHER-3/8	2	2
6	15056	NUT-3/8 UNC	2	2
7	157938	BUSHING-FLANGED	2	2
8	157587	DISK	1	1
8	19880	PIN	1	1
9	157588	PLATE	1	1
10	157942	STUD-SPECIAL	2	2
10	177964	SPRING	2	2
10	15127	WASHER-1/4	2	2
10	15004	NUT-1/4 UNF	2	2
11	15004	NUT-1/4 UNF	2	2
11	15912	WASHER-1/4	2	2
12	161607	JOINT-BALL	2	2
12	15127	WASHER-1/4	2	2
13	15024	NUT-1/4 UNF	2	2
14	157954	LINK	1	1
15	213892	BEARING	1	1
15	15134	WASHER-3/8	1	1
15	15212	COTTER	1	1
16	213894	CRANK	1	1
17	15026	NUT-3/8 UNF	4	4
17	15156	WASHER-3/8	4	4
18	161606	SWIVEL	1	1
18	16752	SCREW-#10 UNF X 3/8	1	1
18	15127	WASHER-1/4	1	1
18	15200	COTTER	1	1
19	161613	CABLE		
20	213256	CABLE CONTROL		
21	213265	CABLE THROTTLE		
22	.....	BRACKET AIR CLEANER, 1006		
23	165300	PIN THROTTLE LEVER		
24	15127	WASHER-1/4		

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
		1 2 3 4	
24	221941	NUT-1/4 UNC	
25	.....	LEVER CONTROL, 1019 REF 60	
26	154565	STOP-WIRE	
27	161613	CABLE	
28	213264	CABLE-THROTTLE	
29	164473	PLATE	
30	16536	CAPSCREW-3/8 UNF X 5/8	
30	15156	WASHER-3/8	
31	161606	SWIVEL	
31	15200	COTTER	
32	164400	CRANK	
33	213255	CABLE-CONTROL	
34	153070	CLAMP	
34	15512	CAPSCREW-#2 UNC X 3/4	
34	15158	LOCKWASHER-1/2	
35	16651	SCREW-#10	
36	161252	STUD-BALL	
36	15923	LOCKWASHER-1/4	
36	15004	NUT-1/4 UNF	
37	164221	LINK	
38	15002	NUT-#10 UNF	
39	18542	CAPSCREW-3/8 UNC 3 1/2	
39	145641	NUT-3/8 UNC	
40	211676	SHROUD	
41	169140	CABLE	
42	.....	CABLE-EMERGENCY STOP	
43	213266	CABLE-THROTTLE	
44	213257	CABLE-CONTROL	
45	124359	CLAMP	
46	15127	WASHER-1/4	
47	169135	SWIVEL	
48	154560	SPRING	
49	15002	NUT-#10 UNF	
49	16701	SCREW-#10 UNF X 1	
50	169134	BRACKET	
51	16708	SCREW-#10 UNF X 1/2	
51	15002	NUT-#10 UNF	
52	15200	PIN-COTTER	
53	169136	BRACKET	
54	.....	ROD END-SEE 2A10 REF 13	

FUEL SYSTEM

FOR 3-53 DIESEL ENGINE



REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
1	157704	CAP	1
1	67353	GASKET	1
2	181771	TANK-FUEL	1
3	15055	NUT-5/16 UNC	2
3	15155	LOCKWASHER-5/16	2
3	18515	WASHER-5/16	2
4	164363	TIE-CONSOLE	1
5	14271	ELBOW	1
6	169119	HOSE	1
7	14358	ELBOW-45 DEGREE	3
7	160622	VALVE-CHECK	1
8	172833	HOSE	1
9	14273	ELBOW	1
10	154494	TUBE	1
11	169120	BRACKET	1
12	16377	CAPSCREW-7/16 UNC X 1 G5	2
12	15157	LOCKWASHER-7/16	2
13	.....	FILTER-PRIMARY, COMES W/ENGINE	1

REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
13	15056	NUT-3/8 UNC, FILTER MOUNTING	2
13	15156	LOCKWASHER-3/8, FILTER MOUNTING	2
13	15129	WASHER-7/16, FILTER MOUNTING	2
14	169122	BRACKET	1
15	16805	CAPSCREW-3/8 UNC X 1 G5	2
15	16815	CAPSCREW-3/8 UNC X 1 1/2 G5	1
15	15156	LOCKWASHER-3/8	3
16	.....	FILTER-SECONDARY, COMES W/ENGINE	1
17	156133	LOCKNUT-3/8 UNC	4
18	169446	HOSE	1
19	119074	CLAMP	2
20	169118	HOSE	1
21	16863	ELBOW-45 DEGREE	2
22	16192	VALVE-SHUT OFF	1
22	15360	ELBOW	1
23	156606	GAUGE-FUEL LEVEL	1
26	16101	CONNECTOR	1
27	14274	ELBOW	1

ELECTRICAL SYSTEM

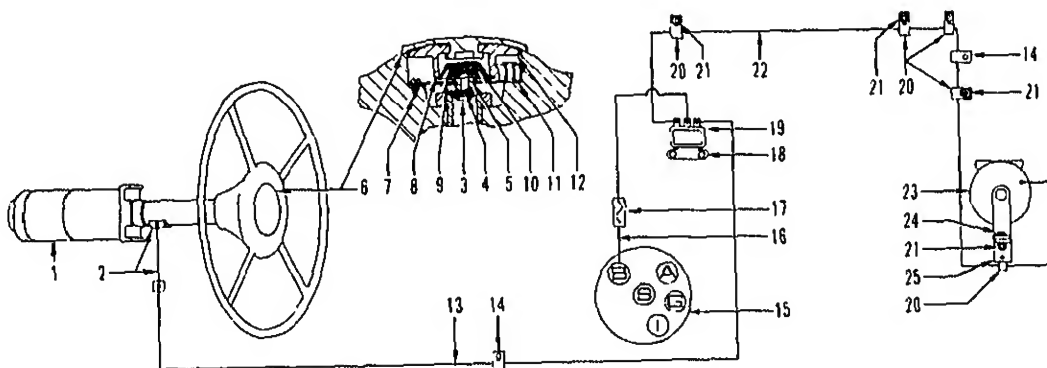
ALTERNATOR	1F09
DISTRIBUTOR	1F04
ELECTRICAL SYSTEM-GAS	1F02
ELECTRICAL SYSTEM-DSL	1F05
HORN	1F08
STARTING MOTOR	1F07

REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.	
			A	B
43	101618	CABLE-GROUND	1	
44	16020	CAPSCREW 3/8 UNC X 1 1/4 GS	1	
44	15156	LOCKWASHER 3/8	1	
45	.....	MOTOR-STARTING SEE 1F07	1	
45	.....	MOTOR-STARTING, COMES WITH ENGINE	1	
46	15039	NUT #0 UNC	1	
46	15119	LOCKWASHER #0	1	
47	132131	CLAMP	1	
48	181898	WIRE	1	
49	.....	THERMOSTAT SEE 1014 REF. 17	1	
50	391750	HARNES-WIRING	1	
51	148658	CONNECTOR	1	
52	.....	SWITCH-MICRO, SEE 2C03 REF 48	1	

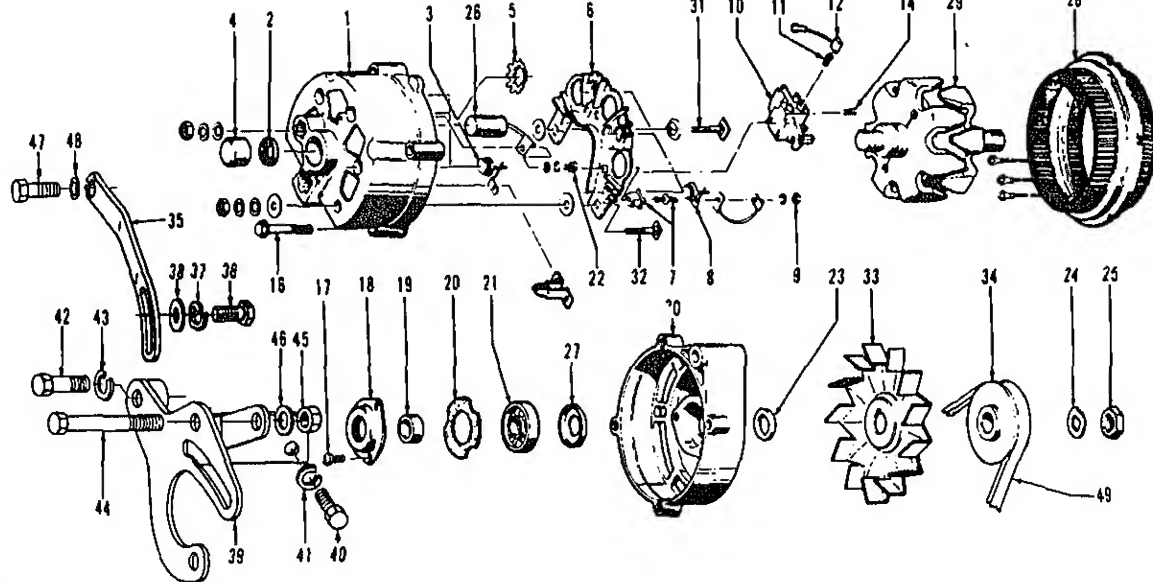
REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.	
			A	B
53	393091	WIRE	1	
54	393092	WIRE	1	
55	.....	PUMP-SPRAY, PAGE 83 REF. 33	1	
56	215017	PLATE-NAME	1	
57	204223	BOOT	1	
57	15086	NUT-JAM, 3/8 UNC	1	
57	15156	LOCKWASHER 3/8	1	
58	124297	CLAMP	1	
58	132972	CLAMP	2	
58	15623	CAPSCREW 3/8 UNF X 5/8	1	
58	15156	LOCKWASHER 3/8	1	
59	16148	NIIPPLE	1	
60	156133	NUT-3/8 UNC	4	

HYSTER PART NO.	NAME OF PART				QTY.	REF.	HYSTER PART NO.	NAME OF PART				QTY.
	1	2	3	4				1	2	3	4	
166541					1 ..	57	166336					1
172812					1	58	55590					1 ..
137699					.. 1	58	166479					1 1
55585					.. 1	59	123675					.. 1
236078					1 1	59	131174					.. 1
97497					1 ..	59	131172					.. 1
137698					.. 1	59	131173					.. 1
97498					1 ..	59	55978					.. 1
236081					.. 1	60	151840					1 ..
97499					1 ..	60	167010					.. 1
236082					.. 1	62	151837					4 ..
55894					1 1	63	16598					2 2
156289					1 ..	63	16828					1 1
97360					.. 1	64	15156					3 3
166337					.. 1							

HORN



HYSTER PART NO.	NAME OF PART				QTY.	REF.	HYSTER PART NO.	NAME OF PART				QTY.
	1	2	3	4				1	2	3	4	
.....					1	14	124359					2
.....					1	15	.....					1
.....					1	15	.....					1
.....					1	16	121062					1
.....					1	17	53124					1
.....					1	18	15004					2
.....					1	18	15912					2
.....					1	19	103739					1
163910					1	20	132131					7
166169					1	21	15055					6
166174					3	21	15913					6
166171					1	22	164767					1
166173					1	23	126364					1
166172					1	24	16836					1
166175					1	25	164758					1
166170					1							
164766					1							



KEY

A- FOR GAS ENGINE
 B- FOR 1-236 DIESEL ENGINE
 C- FOR 3-53 DIESEL ENGINE.

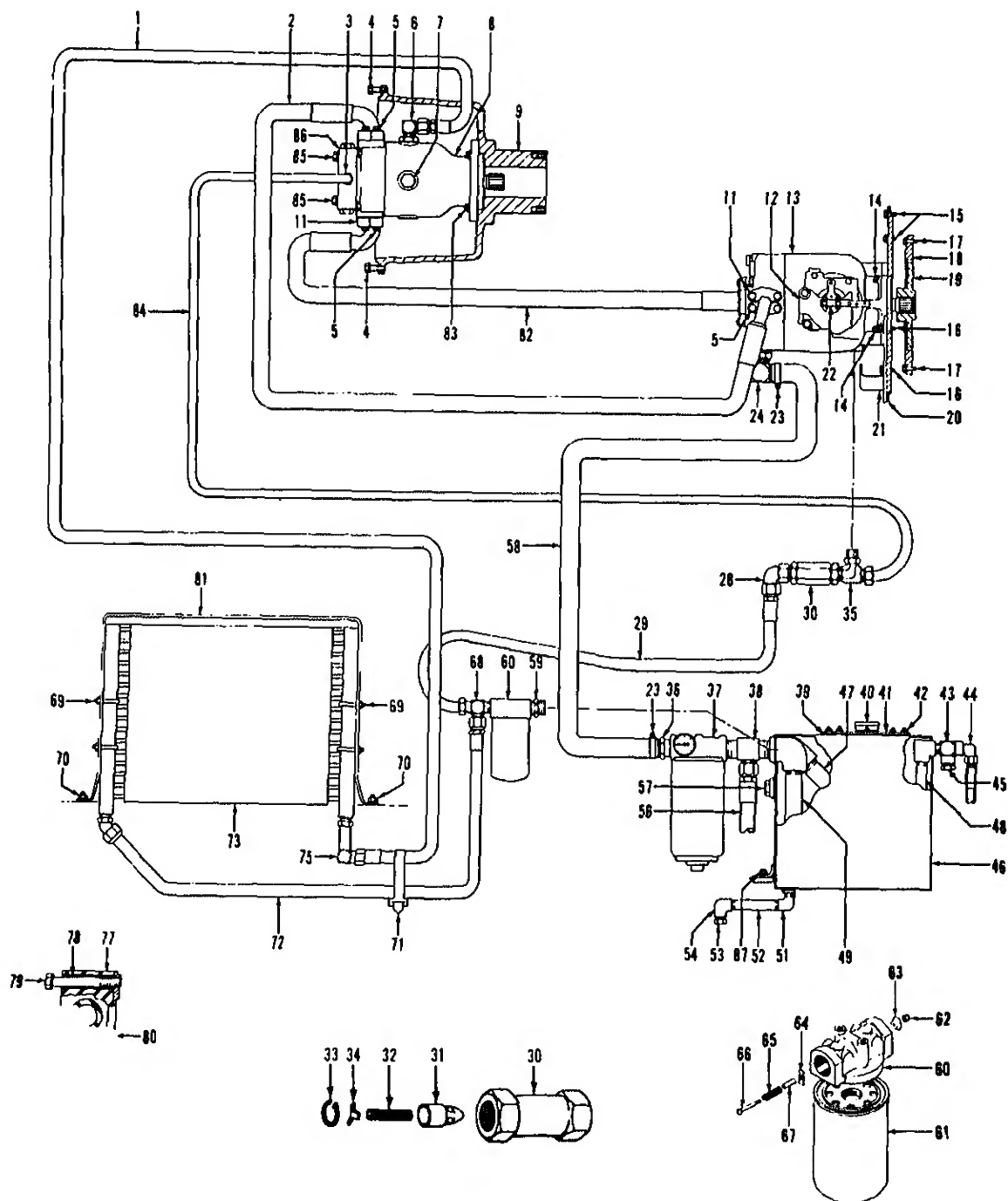
REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	A	B	C
1 2 3 4						
1	139190	ALTERNATOR	1			
2	152236	ALTERNATOR-COMES W/ENGINE	1			
3	128837	FRAME S.R.E.	1			
4	128836	RETAINER-BEARING	1			
5	128836	DIODE-NEGATIVE, BLACK	1			
6	128838	BEARING-S.R.E.	1			
7	128839	SPRING-CAPACITOR	1			
8	128844	HEAT SINK	1			
9	128846	TERMINAL PACKAGE	1			
10	128845	DIODE-POSITIVE	1			
11	15039	NUT	1			
12	128844	LOCKWASHER	1			
13	138559	HOLDER AND BRUSH	1			
14	128848	SPRING-BRUSH	1			
15	.....	BRUSH	1			
16	128851	SCREW	1			
17	128842	LOCKWASHER	1			
18	128852	BOLT-THRU	1			
19	138554	SCREW	1			
20	128831	RETAINER-BEARING	1			
21	138553	COLLAR-INSIDE	1			
22	202004	GASKET	1			
23	235950	BEARING-DRIVE END	1			
24	16713	SCREW	1			
25	128842	LOCKWASHER	1			
26	128841	WASHER	1			
27	128834	COLLAR-OUTSIDE	1			
28	128835	LOCKWASHER	1			
29	55580	NUT-SHAFT	1			
30	128840	CAPACITOR	1			
31	152234	SLINGER-GREASE	1			
32	152235	STATOR	1			
33	154793	CLIP-STATOR LEAD	1			
34	138555	ROTOR	1			
35	190047	FRAME-DRIVE END	1			
36	152237	TERMINAL PACKAGE-GROUND	1			
37	152238	TERMINAL PACKAGE-BATT.	1			
38	154794	INSULATOR-BATTERY TERM.	1			
39	152239	WASHER-INSULATOR	1			
40	126358	FAN	1			
41	164083	PULLEY	1			

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	A	B	C
1 2 3 4						
31	146689	PULLEY	1			
32	155416	ARM ADJUSTING	1			
33	160899	ARM ADJUSTING	1			
34	154402	ARM-ADJUSTING	1			
35	164997	CAPSCREW-5/16 UNC X 1 G5	1			
36	992503	SET SCREW	1			
37	15639	CAPSCREW-5/16 UNC X 1	1			
38	15155	LOCKWASHER-5/16	1			
39	15156	LOCKWASHER-3/8	1			
40	15175	WASHER-5/16	1			
41	18515	WASHER-5/16	1			
42	155437	BRACKET-ALTERNATOR	1			
43	160895	BRACKET-ALTERNATOR	1			
44	154399	BRACKET-ALTERNATOR	1			
45	16550	CAPSCREW-3/8 UNC X 1 1/8 G5	1			
46	16828	CPSCR.-3/8 UNC X 1 1/4 G5	3			
47	160898	STUD	2			
48	15156	LOCKWASHER-3/8	2			
49	992050	LOCKWASHER	2			
50	177947	LOCKWASHER-3/8	3			
51	17150	NUT-3/8 UNF	2			
52	15006	NUT	2			
53	16559	CAPSCREW-7/16 UNC X 1 3/4	1			
54	16805	CAPSCREW-3/8 UNC X 1 G5	1			
55	15157	LOCKWASHER-7/16	1			
56	15156	LOCKWASHER-3/8	1			
57	15134	WASHER-3/8	1			
58	16741	CPSCR.-3/8 UNC X 3 1/4 G5	1			
59	17331	CPSCR.-3/8 UNF X 3 1/2 G5	1			
60	17155	CPSCR.-3/8 UNF X 3 1/4 G5	1			
61	17180	LOCKNUT-3/8 UNC	1			
62	43740	NUT-3/8 UNF	1			
63	15134	WASHER-3/8	1			
64	16696	CAPSCREW-3/8 UNF X 7/8 G5	1			
65	15156	LOCKWASHER-3/8	1			
66	154382	V-BELT	1			
67	.....	V-BELT, SEE 1805 REF. 63	1			

FIRST USED ON SERIAL NO. 8096 2302

TRANSMISSION AND POWER TRAIN

CONTROL LINKAGE	2A09
FINAL DRIVE-C350B	2B05
FINAL DRIVE-C348A	2B07
HYDRAULIC MOTOR	2A11
HYDRAULIC PUMP	2A13 & 2B03
HYDRAULIC SYSTEM	2A05
OIL FILTER	2B02
SERVO CONTROL VALVE	2B01



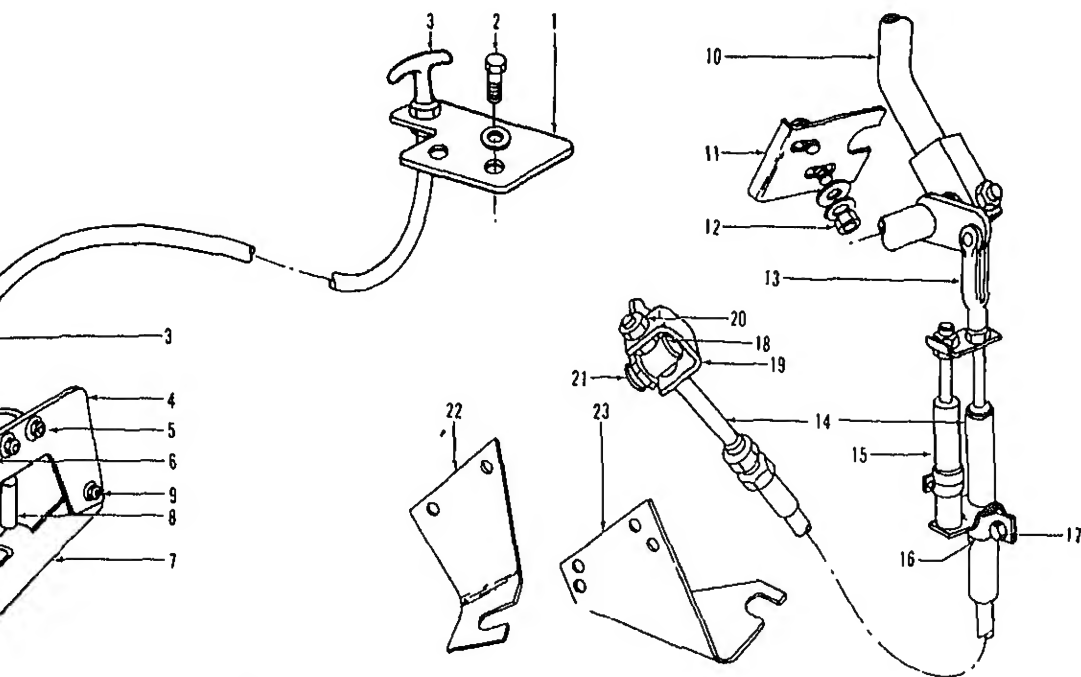
~~3-53 DIESEL ENGINE~~
~~3-53 DIESEL ENGINE~~
 3-53 DIESEL ENGINE.

HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.		
		A	B	C
393087	HOSE	1		
393087	HOSE	1		
393087	HOSE	1		
111331	CONNECTOR	1		
.....	CAPSCREW-PG. 2806 REF. 62	12	12	12
18559	CAPSCREW-7/16 UNC X 1 3/4 G5	16	16	16
15157	LOCKWASHER-7/16	16	16	16
112475	ELBOW	1		
14603	PLUG	2	2	2
.....	MOTOR-HYDRAULIC, PAGE 2A12	1		1
.....	CARRIER-MOTOR, PAGE 2806 REF. 2	1		1
156690	FLANGE-SPLIT	8		8
169787	O-RING	4		4
.....	PUMP-HYDRAULIC, PAGE 2804	1		1
221565	CAPSCREW-1/2 UNC X 1 1/4	4		4
16805	CAPSCREW-3/8 UNC X 1 1/4	1		1
16828	CPSCR.-3/8 UNC X 1 1/4 G5	8		8
15156	LOCKWASHER-3/8	10	10	8
16828	CPSCR.3/8 UNC X 1 1/4 G5	2		2
16815	CPSCR.3/8 UNC X 1 1/2 G5	2		2
15156	WASHER-3/8	4		4
15943	BOLT 3/8 UNC X 1 1/2	1		1
17112	BOLT-3/8 UNC X 1 1/4	8		8
156643	PLATE-DRIVE	1		1
169144	PLATE-DRIVE	1		1
169144	PLATE-DRIVE	1		1
392092	HUB	1		1
213624	PLATE-MOUNTING	1		1
213627	PLATE-MOUNTING	1		1
214931	PLATE-MOUNTING	1		1
.....	BRACKET-PAGE 2A10 REF. 8	1		1
.....	LEVER-PAGE 2A10 REF. 2	1		1
130845	CLAMP-HOSE	2	2	2
186227	NIPPLE	1		1
15995	REDUCER	1		1
17301	ELBOW	1		1
393080	HOSE	1		1
187282	VALVE-CHECK	1		1
190004	POPPET	1		1
190003	SPRING	1		1
190001	SNAP RING	1		1
190002	WASHER	1		1
186228	FITTING	1		1
17585	NIPPLE	1		1
.....	FILTER-OIL, SEE PAGE 2802	1		1
177457	TEE-SPECIAL	1		1
168812	FITTING-SPECIAL	1		1
156607	GASKET	1		1
164227	CAP-OIL FILLER	1		1
118742	GASKET	1		1
156670	COVER-TANK	1		1
15055	NUT-5/16 UNC	8		8
15155	LOCKWASHER-5/16	8		8
156696	TEE	1		1

REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.		
			A	B	C
44	17300	ELBOW			1
45	17300	PLUG			1
45	17345	CONNECTOR			1
46	393156	TANK-HYDRAULIC			1
47	180442	PIPE			1
48	156655	PIPE			1
49	156656	PIPE			1
50	14683	CONNECTOR			1
51	17324	ELBOW			1
52	15346	NIPPLE			1
53	14387	PLUG			1
54	12818	ELBOW			1
56	.....	HOSE-SEE PAGE 2D02 REF.26			1
57	146073	GAUGE-VIEW			1
58	393254	HOSE			1
59	17697	NIPPLE-REDUCER			1
60	180441	FILTER-OIL, RETURN LINE			1
60	182291	HEAD			1
61	180595	ELEMENT			1
62	182293	LOCKNUT			1
63	182292	VALVE-BY PASS			1
64	182290	GUIDE-BY PASS			1
65	182288	SPRING			1
66	182287	SCREW			1
67	182289	SPACER			1
68	14596	TEE			1
69	190517	J-BOLT			2
69	190515	U-BOLT			2
69	221341	NUT-1/4 UNC			4
69	197068	WASHER-1/4			4
70	145641	NUT-3/8 UNC			4
70	15134	LOCKWASHER-3/8			4
71	129563	CLAMP-STRAP			1
71	176451	CLAMP			1
71	15512	CAPSCREW-1/2 UNC X 3/4			1
71	15158	LOCKWASHER-1/2			1
72	393081	HOSE			1
73	186259	COOLER-OIL			1
75	82426	ELBOW			2
77	391075	BLOCK-RUBBER			1
78	391076	SPACER			2
79	18540	CAPSCREW-3/8 UNC X 3 G5			2
79	15056	NUT-3/8 UNC			2
80	215041	CHANNEL			1
81	186340	BRACKET-SUPPORT			1
82	393086	HOSE			1
83	.....	CAPSCREW-PG. 2806 REF. 61			4
84	393078	HOSE			1
85	.....	CAPSCREW-PG. 2A11 REF. 2			6
86	.....	VALVE-SEE PG. 2A11 REF. 1			1
87	145641	NUT-3/8 UNC			4
87	15134	LOCKWASHER-3/8			4

~~USED ON C3500 ONLY~~

~~USED ON C340A ONLY~~

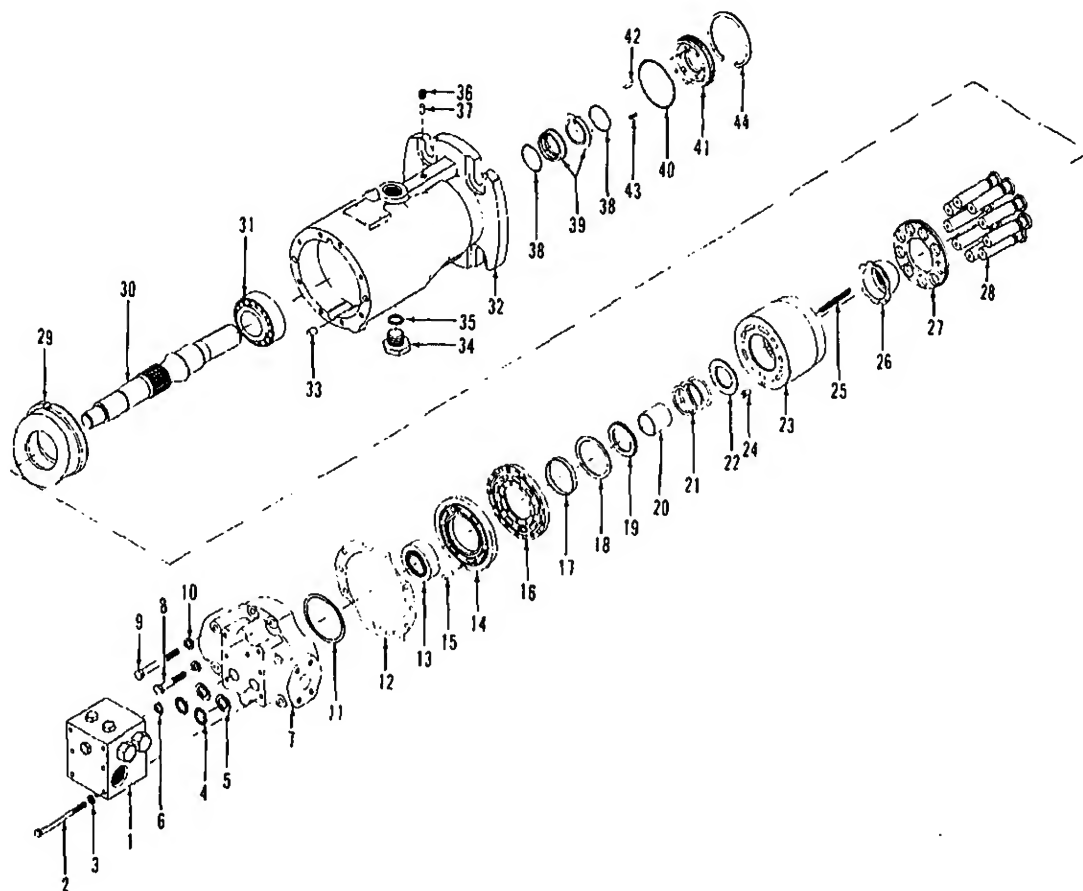


ER	NAME OF PART				
NO.	1	2	3	4	QTY.
31	PLATE				1
..	BRACKET-BATTERY, SEE 1F05				1
36	CABLE-5/16 UNC X 3/4				2
55	WASHER-5/16				2
71	CABLE-PULL				1
29	PLATE				1
32	U-BOLT				1
75	WASHER-5/16				2
97	U-BOLT				1
55	WASHER-5/16				2
30	LEVER				1
07	PIN				1
49	SCREW-SHOULDER				1
75	WASHER-5/16				1
15	WASHER-5/16				1
54	WASHER-1/4				1
00	NUT-1/4 UNC				1
..	LEVER-SEE 1D10 REF. 1				1
05	PLATE-LOCK				1
49	SCREW-SHOULDER				2
15	WASHER-5/16				2
07	WASHER-SPRING				2

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
12	18500	WASHER-#12	2
12	15154	WASHER-1/4	2
12	15000	NUT-1/4 UNC	2
13	125	ROD END	1
13	213896	PIN-ROD	1
13	15200	PIN-CUTTER	1
14	393085	CABLE-PUSH PULL	1
15	392015	SWITCH	1
16	392016	CLAMP	1
17	220501	SCREW-#10 UNC X1	2
17	15002	NUT-#10 UNC	2
17	391727	SPACER	2
18	382019	SWIVEL	1
19	392018	BRACKET	1
20	15024	NUT-1/4 UNF	2
21	54115	SNAP RING	1
22	393084	BRACKET	1
23	393322	BRACKET	1

~~USED ON GAS ENGINE ONLY~~

~~USED ON 1 230 OR 3 53 DIESEL ENGINE~~



HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
393467	MOTOR-HYDRAULIC	1
267026	VALVE-MANIFOLD	1
18524	CAPSCREW-5/16 UNC X 3 3/4	6
194402	WASHER	6
265732	O-RING	2
165064	RING-BACK UP	2
39767	O-RING	1
194394	END CAP-MOTOR	1
16376	CAPSCREW-3/8 UNC X 2	3
18540	CAPSCREW-3/8 UNC X 3	5
190583	WASHER	8
190585	SHIM	AR
190586	GASKET-FND CAP	1
190587	BEARING-REAR	1
194395	PLATE-VALVE	1
222710	PIN	1
190591	PLATE-BEARING	1
267028	PILOT-BEARING PLATE	1
190593	RING-RETAINING	1
190594	RETAINER-SPRING	1
190595	GUIDE-SPRING	1
267029	SPRING-CYLINDER BLOCK	1
190597	SEAT-SPRING	1
.....	BLOCK-CYLINDER	1
190599	PIN	1

REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
25	# 267030	SPRING-RETAINER	6
26	# 190601	GUIDE-SLIPPER RETAINER	1
27	# 190602	RETAINER-SLIPPER	1
28	# 267031	PISTON	9
29	194396	SWASHPLATE-FIXED	1
30	194397	SHAFT-MOTOR	1
31	190625	BEARING-FRONT	1
32	194398	HOUSING-FIXED	1
33	222719	PIN	2
34	216590	PLUG	1
35	16485	O-RING	1
36	15483	PLUG	1
37	184055	PIN	1
38	# 265788	O-RING	2
39	# 190643	SEAL SET	1
40	# 15880	O-RING	1
41	# 190647	RETAINER-SEAL	1
42	# 226832	PIN-GROOVE	1
43	# 190644	SPRING-SEAL	6
44	# 190648	RING-RETAINING	1

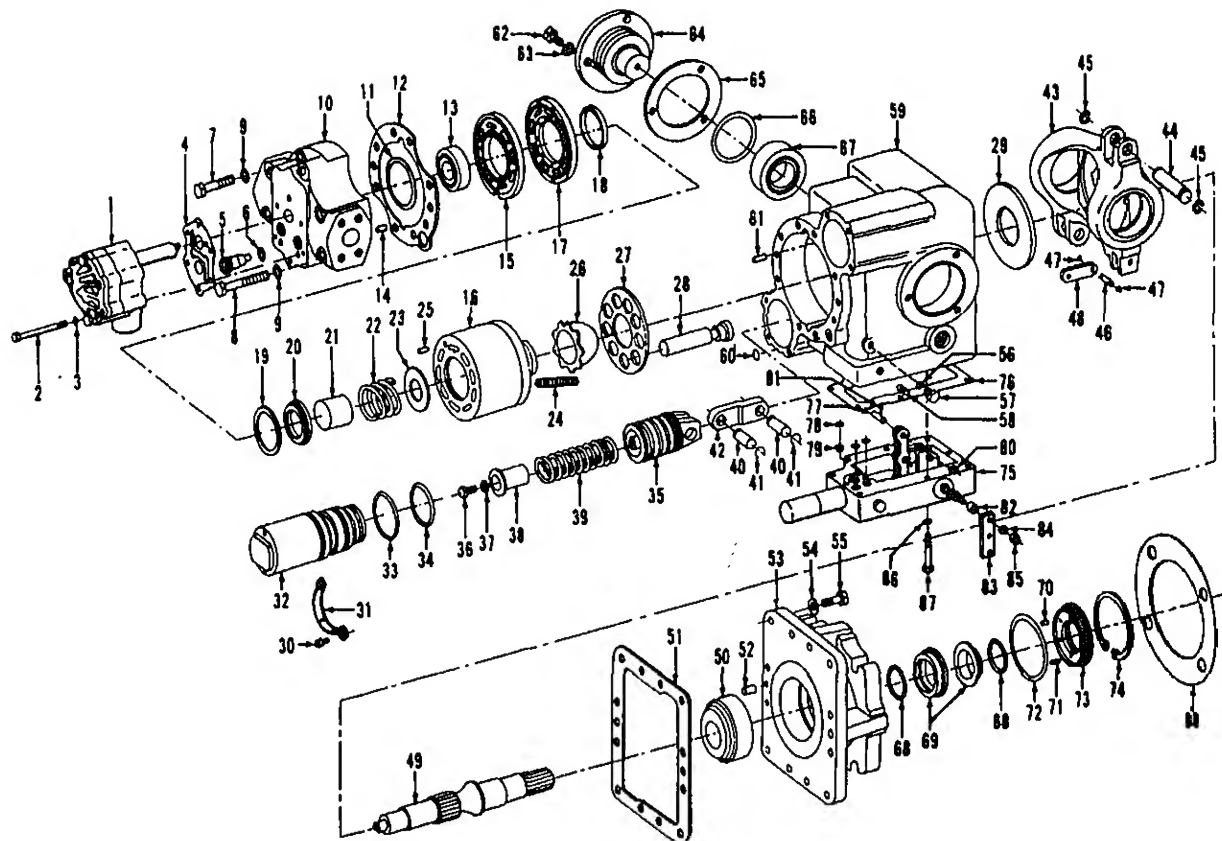
*INCLUDED IN MANIFOLD VALVE KIT 267025.
 #INCLUDED IN VALVE SEAL KIT 194393.
 #INCLUDED IN CYLINDER BLOCK KIT 267027.
 #INCLUDED IN SEAL KIT 190641.



STER T NO.	NAME OF PART				QTY.
	1	2	3	4	
5015	FILTER-OIL				1
1146	HEAD & PLUG				1
1152	INDICATOR				1
5033	SPACER-BY-PASS VALVE				1
7017	SPACER-BY-PASS VALVE, 5 PSI				1
1161	LOCKNUT-BY-PASS				1
1160	VALVE-BY-PASS				1
1156	GUIDE-BY-PASS				1
1158	CAP-STEM, RY-PASS				1
1159	SCREW-BY-PASS				1
....	SPRING-BY-PASS				1

REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.
		1	2	3	4	
10	* 161154	O-RING, HOUSING				1
11	* 161150	SEAL-OIL				2
12	* 161155	ELEMENT				1
13	161148	HOUSING				1
14	161149	SPRING-ELEMENT				1
15	* 161153	GASKET-CENTER POST				1
16	161151	WASHER-BACK UP				1
17	161147	POST-CENTER				1
20	237011	POST-CENTER, HEAVY DUTY				1

*INCLUDED IN SEAL AND ELEMENT KIT 237014.



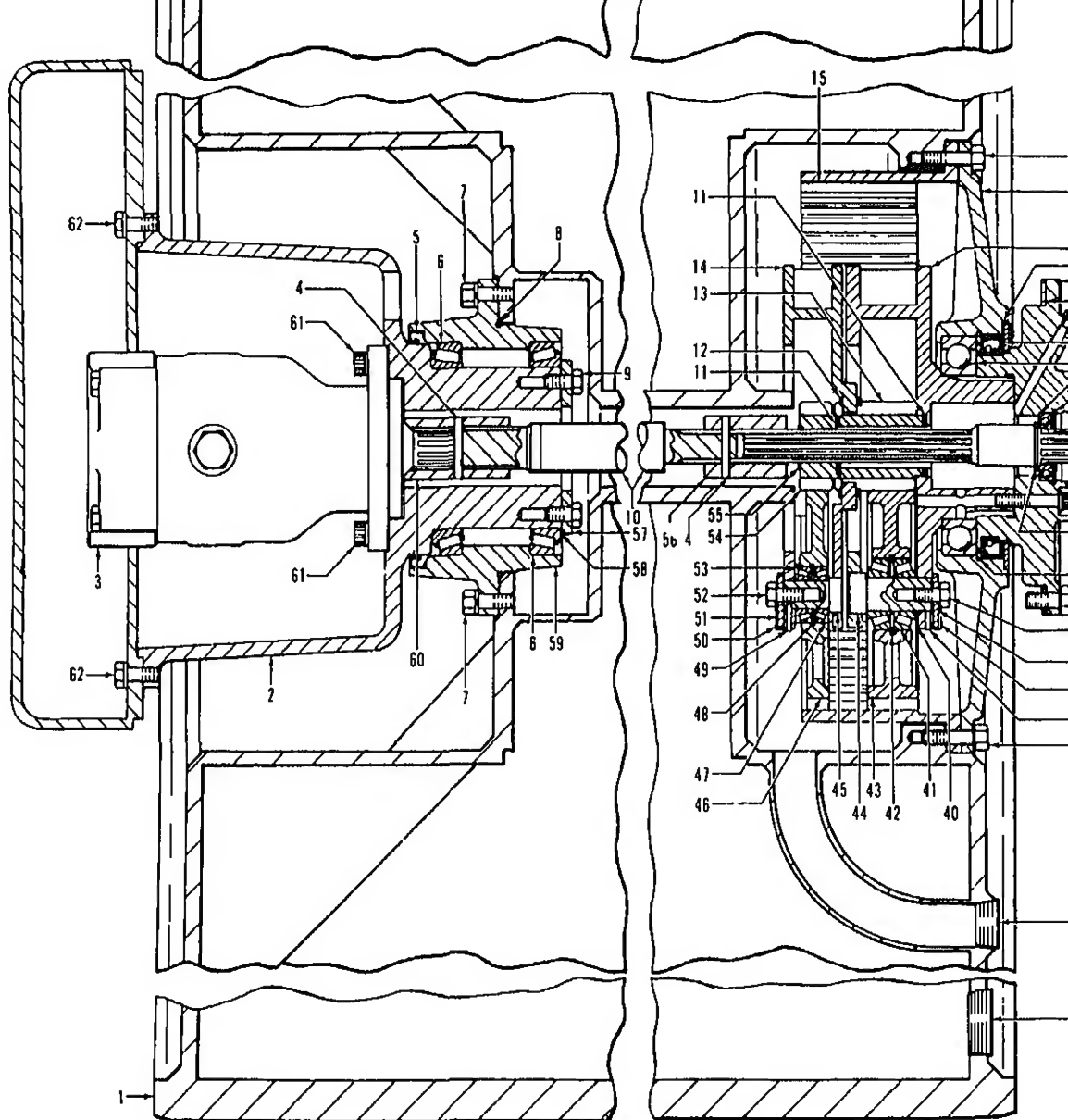
REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
		1 2 3 4	
1	185902	PUMP-HYDRAULIC	1
1	190573	PUMP-CHARGE	1
1	190576	PUMP	1
2	18478	CAPSCREW-1/4 UNC X 3 G5	4
3	221763	WASHER	4
4	190577	GASKET	1
5	190578	VALVE-CHECK	2
6	190580	O-RING	1
7	190581	CAPSCREW	3
8	190582	CAPSCREW	5
9	190583	WASHER	8
10	190584	CAP-END	1
11	190585	SHIM	AR
12	190586	GASKET-END CAP	1
13	190587	BEARING	1
14	190588	PIN	1
15	190589	PLATE-VALVE	1
16	190590	CYLINDER BLOCK	1
16	190600	BLOCK	1
17	190591	PLATE-BEARING	1
18	190592	PILOT	1
19	190593	RING-RETAINING	1
20	190594	RETAINER-SPRING	1
21	190595	GUIDE-SPRING	1
22	190596	SPRING-CYLINDER BLOCK	1
23	190597	SEAT-SPRING	1
24	190598	SPRING-RETAINER	9
25	190599	PIN	1
26	190601	GUIDE-RETAINER	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
		1 2 3 4	
27	190602	RETAINER-SLIPPER	1
28	190603	PISTON	9
29	190604	PLATE-THRUST	1
30	190605	CAPSCREW	4
31	190606	RETAINER-SLEEVE	2
32	190607	SLEEVE-SERVO	1
32	218051	SLEEVE	2
33	39673	O-RING	1
34	39671	O-RING	1
35	190611	PISTON-SERVO	2
35	190616	PISTON	2
36	190612	CAPSCREW	1
37	190613	WASHER	1
38	190614	GUIDE-SPRING	1
39	190615	SPRING	1
40	190617	PIN	2
41	190618	RING-RETAINING	4
42	190619	LINK	1
43	190620	PLATE-SWASH	1
44	190617	PIN	2
45	190618	RING-RETAINING	4
46	190621	PIN	1
47	190622	RING-RETAINING	2
48	190623	LINK	1
49	190624	SHAFT-DRIVE	1
50	190625	BEARING	1
51	190626	GASKET	1
52	190627	PIN	2
53	190628	COVER-FRONT	1

REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
54	190583	WASHER	12
55	190629	CAPSCREW	12
56	190630	O-RING	1
57	14591	PLUG	1
58	15483	PLUG	1
59	190633	HOUSING	1
60	39347	O-RING	1
61	190635	PIN	2
62	190636	CAPSCREW	6
63	190583	WASHER	6
64	190637	TRUNNION	2
65	190638	SHIM	AR
66	190639	O-RING	2
67	190640	BEARING	2
68	* 190642	O-RING	2
69	* 190643	SEAL	1
70	* 190645	PIN	1
71	* 190644	SPRING-SEAL	6
72	* 190646	O-RING	1

REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
73	* 190647	RETAINER-SEAL	1
74	* 190648	RING-RETAINING	1
75	190649	VALVE-CONTROL	1
75	190653	VALVE	1
76	190650	GASKET	1
77	190651	PIN	1
78	39347	O-RING	3
79	190652	ORIFICE	1
80	221763	WASHER	1
81	190654	COTTER	1
82	190655	SPACER	1
83	.....	HANDLE-SEE 2A10	1
84	15923	WASHER	1
85	190658	NUT	1
86	190575	WASHER	9
87	18473	CAPSCREW	9
88	185903	GASKET	1

*INCLUDED IN SEAL KIT 190641.



REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
1	178149	DRUM-DRIVE	1
2	212600	CARRIER-MOTOR	1
2	390453	CARRIER-MOTOR	1
3	.....	MOTOR-HYDRAULIC-SEE 2A11 & 2A12	1
4	103547	PIN	2
4	198214	PIN	2
5	150194	SEAL-OIL	1
6	155369	CONE-BEARING	2

REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4
6	155370	CUP-BEARING
7	16823	CAPSCREW-5/8 UNF X 1 1/2 G5
7	15160	LOCKWASHER-5/8
8	94086	O-RING
9	56998	BOLT-1/2 UNC X 1 1/4 G8
10	393059	SHAFT-DRIVE
10	393059	SHAFT-DRIVE

FINAL DRIVE

FOR C350B

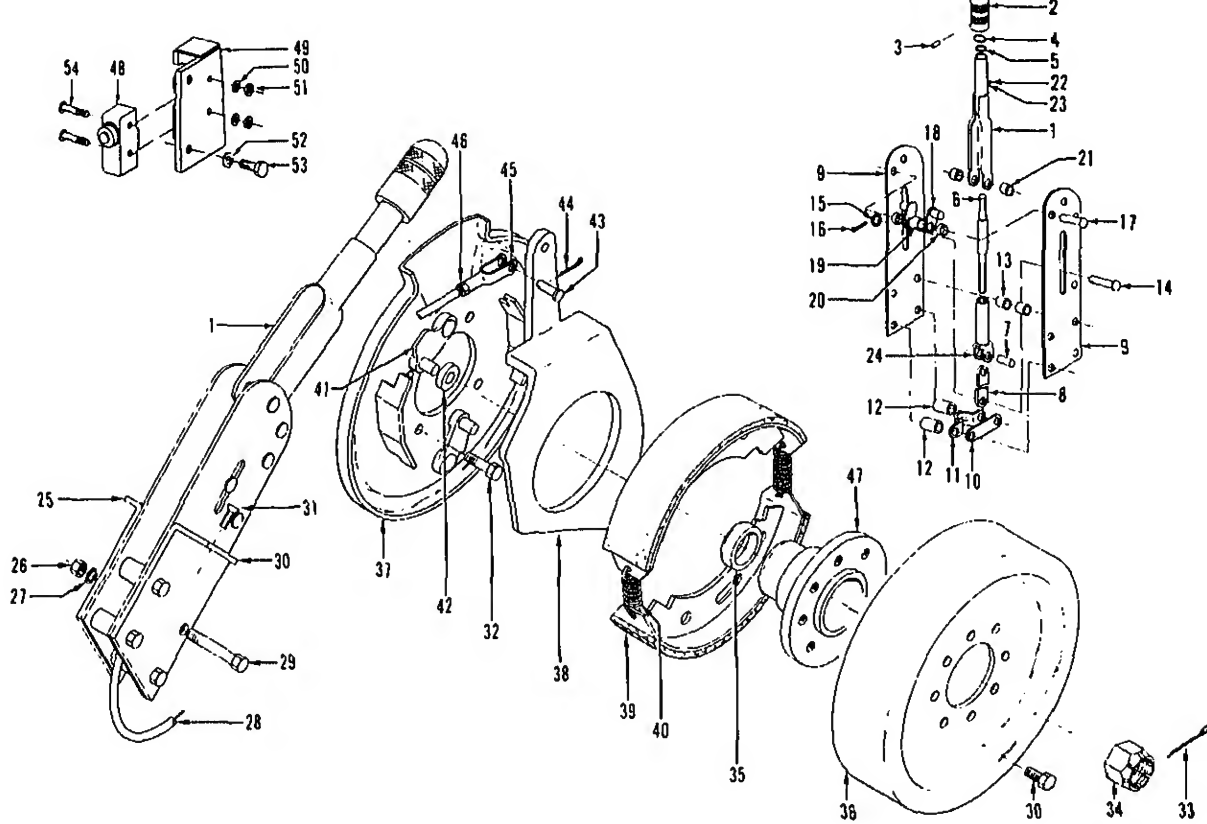
STER T NO.	NAME OF PART				QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART				QTY.
	1	2	3	4				1	2	3	4	
7458	WASHER				2	39	15320	PLUG				1
8826	BEARING-THRUST				2	40	156197	WASHER				3
6201	SNAP RING				2	41	156194	CUP-BEARING				6
7459	GEAR-SUN				1	41	156195	CONE-BEARING				6
6174	CARRIER-PLANETARY				1	42	156193	SNAP RING				3
4029	GEAR-RING				1	43	154023	GEAR-PLANETARY PINION				3
5316	PLUG				1	44	156196	PIN				3
7577	BOLT-1/2 UNF X 1 3/4 G8				16	45	156183	PIN				3
4028	HUB				1	46	154026	GEAR-PLANETARY PINION				3
6187	CARRIER-PLANETARY				1	47	156181	CUP-BEARING				6
6201	PLATE				1	47	156182	CONE-BEARING				6
1462	PLATE				1	48	156180	SNAP RING				3
3275	FLANGE				1	49	180397	PIN-GROOVE				3
0494	FLANGE				1	50	156185	PLATE-LOCK				3
0460	SHIM-.005				AR	51	156186	PLATE				3
0461	SHIM-.020				AR	52	16020	CAPSCREW-1/2 UNF X 1 G5				3
0462	SHIM-.062				AR	53	156184	WASHER-THRUST				3
6748	FITTING-LUBE				1	54	167457	GEAR-SUN				1
6049	FITTING-LUBE				1	55	34507	SNAP RING				1
6200	SEAL-OIL				1	56	183543	COUPLING				1
4326	BEARING-BALL				1	57	161246	PLATE				1
4307	BEARING-BALL				1	58	161244	SHIM-.005				AR
2921	SNAP RING				1	58	161245	SHIM-.020				AR
6205	SEAL-OIL				1	59	178144	CARRIER-BEARING				1
3274	SHAFT				1	60	213509	COUPLING				1
7065	SNAP RING				1	60	392189	COUPLING				1
6206	CAPSCREW-1/2 UNF X 2 1/4				4	61	213611	CAPSCREW-1/2 UNC X 1 1/4				4
6192	SNAP RING				1	62	18588	CAPSCREW-1/2 UNC X 1 1/2 G5				12
8528	BOLT-5/8 UNC X 1 1/4 G8				16	62	15158	LOCKWASHER-1/2				12
7562	CAPSCREW-1/2 UNF X 1 1/4 G5				3							
6186	PLATE				3							
6185	PLATE-LOCK				3							
0397	PIN-GROOVE				3							
5318	PLUG				1							

~~WASHER USED ON SERIAL NO. 8040 3181~~
~~WASHER USED ON SERIAL NO. 8040 3180~~
~~WASHER USED ON SERIAL NO. 8040 3189~~

BRAKE AND LINKAGE

PARKING BRAKE AND LINKAGE 2C03





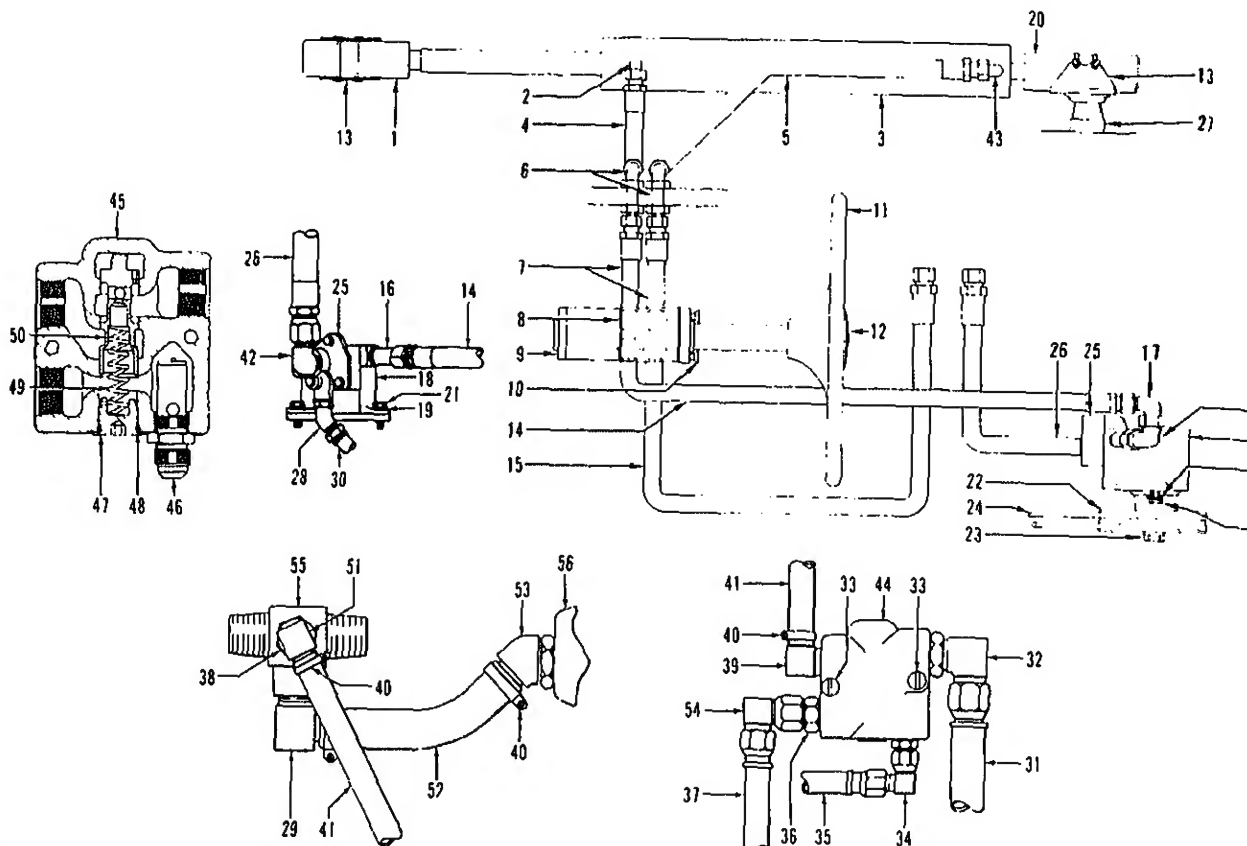
REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	204773	LEVER-PARKING BRAKE	1
1	210614	LEVER-HANDLE	1
2	204966	KNOB	1
3	.....	PIN-ROLL	1
4	.....	WASHER-SPRING	1
5	.....	O-RING	1
6	.....	SCREW-ADJUSTING	1
7	54871	PIN	1
8	54863	LINK	1
9	77584	BRACKET-MOUNTING	2
10	119878	SPACER	1
11	127876	CLAMP	1
12	127875	SPACER	2
13	127874	SPACER	2
14	54861	PIN	1
15	18515	WASHER	1
16	15213	COTTER-3/32 X 1	1
17	54872	RIVET	1
18	54864	BRACKET-PIVOT	2
19	54865	SPACER	1
20	54873	SPACER	2
21	210615	SPACER	2
22	210616	FITTING	1
23	210617	SPACER	1
24	54860	TUBE-ADJUSTING	1
25	156243	PLATE-SUPPORT, RH	1
26	15055	NUT-5/16 UNC	4
27	15155	LOCKWASHER-5/16	4
28	191342	CABLE-PARKING BRAKE	1
28	128408	CLAMP	1
28	15155	LOCKWASHER-5/16	1
28	15055	NUT-5/16 UNC	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
29	16782	CAPSCREW-5/16 UNC X 2 1/4 G5	4
30	156242	PLATE-SUPPORT, LH	1
31	16080	CAPSCREW-3/8 UNC X 3/4	2
32	163739	CAPSCREW-SPECIAL	12
33	15225	COTTER-1/8 X 1	1
34	21110	NUT-CASTLE	1
35	156245	SPACER	1
36	191140	BRAKE	1
36	191341	DRUM-BRAKE	1
37	163734	PLATE-BACKING	1
38	172264	LEVER-OPERATING	1
39	191345	BRAKE SHOE AND LINING	2
40	77717	SPRING-RETURN	1
41	194190	KIT-PAWL	2
42	164199	ROLLER	1
43	142	PIN-ROD END	1
44	15212	COTTER-3/32 X 3/4	1
45	141	ROD END	1
46	15026	NUT-JAM, 3/8 UNF	1
47	213276	HUB	1
47	390721	HUB	1
47	390697	SEAL	1
47	391320	WASHER	1
48	139773	SWITCH-MICRO	1
49	165786	COVER	1
50	16743	LOCKWASHER-#6	2
51	12425	NUT-#6 UNF	2
52	15155	LOCKWASHER-3/16	2
53	17484	CAPSCREW-5/16 UNF X 3/8 G5	2
54	18815	SCREW-#6 UNF X 1 1/4	2

USED ONLY ON C340A

STEERING SYSTEM

STEERING CONTROL	2004
STEERING CYLINDER AND SOCKETS	2007
STEERING PUMP-043 AND 4-236 DSL	2006
STEERING PUMP-3-53 DSL	2007
STEERING SYSTEM	2003
STEERING TRUNNION AND DRUMS	2005



KEY

* FOR GAS ENGINE.
 B FOR 1-236 DIESEL ENGINE.
 C FOR 3-53 DIESEL ENGINE.

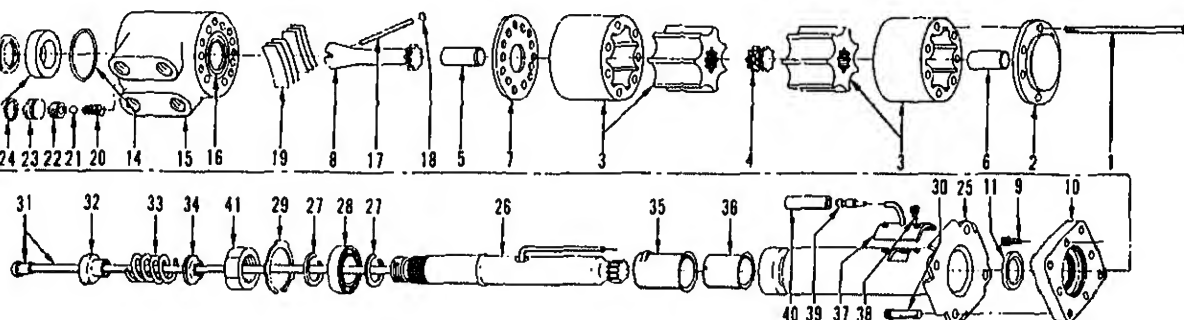
REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.		
			1	2	3
1	.....	SOCKET-ROD END, SEE 2007 REF. 17	1	1	1
2	17306	ELBOW	1	1	1
3	.....	CYLINDER-STEERING, SEE 2007 REF. 1	1	1	1
4	96522	HOSE-HYDRAULIC	1	1	1
5	73470	HOSE-HYDRAULIC	1	1	1
6	16458	ELBOW	2	2	2
6	14761	NUT	1	1	1
7	155164	HOSE-HYDRAULIC	2	2	2
8	16541	CONNECTOR	4	4	4
8	16484	O-RING	1	1	1
9	.....	CONTROL-STEERING, 2004	1	1	1
10	139140	CAPSCREW-3/8 UNC X 1 1/2	2	2	2
11	155387	WHEEL-STEERING	1	1	1
12	155459	PLUG-BUTTON	1	1	1
13	141916	COVER-DUST	2	2	2
14	76230	HOSE-TO TEE	1	1	1
14	155464	HOSE-TO STEERING CONTROL	1	1	1
15	158406	HOSE-TO OIL COOLER	1	1	1
16	163925	ELBOW-SPECIAL	1	1	1
16	16586	LOCKNUT	1	1	1
16	16484	O-RING	1	1	1
17	16989	ELBOW	1	1	1
18	.....	PUMP-STEERING, 2006	1	1	1
19	15134	WASHER-3/8	2	2	2
19	15924	LOCKWASHER-1/2	1	1	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.		
			1	2	3
20	.....	SOCKET-ANCHOR END, 2007 REF. 17	1	1	1
21	16805	CAPSCREW-3/8 UNC X 1 G5	1	1	1
21	16854	CAPSCREW-3/8 UNC X 5 G5	1	1	1
22	156040	SHAVE	1	1	1
23	15135	WASHER-1/2	1	1	1
23	17408	LOCKNUT-1/2 UNF	1	1	1
24	.....	V-BELT SET, 1806 REF. 72	1	1	1
25	169948	MANIFOLD-PUMP INLET	1	1	1
25	169947	MANIFOLD-PUMP INLET	1	1	1
25	179805	GASKET-MANIFOLD	1	1	1
25	12949	CAPSCREW-3/4 UNC X 3/4	1	1	1
25	164368	WASHER	1	1	1
25	18425	LOCKWASHER-1/4	1	1	1
26	177455	HOSE-TO FILTER	1	1	1
26	177456	HOSE-TO FILTER	1	1	1
26	177458	CONNECTOR	1	1	1
26	16486	O-RING	1	1	1
26	176492	CLAMP	1	1	1
27	.....	STUD-BALL, 2005 REF. 9	1	1	1
28	131461	ELBOW-45 DEGREE	1	1	1
28	16585	LOCKNUT	1	1	1
28	16485	O-RING	1	1	1
29	110177	NIPPLE-FILTER END	1	1	1
30	76230	HOSE-TO HYDRAULIC TANK	1	1	1
30	125004	FLANGE	1	1	1

16588	LOCKNUT	1	43	175873	ELBOW	1
16486	O-RING	1	44	169128	VALVE-FLOW DIVIDER	1
18347	SCREW-1/4 UNC X 2 1/2	2	45	.....	BODY	1
15154	LOCKWASHER-1/4	2	46	161878	VALVE-RELIEF	1
15054	NUT-1/4 UNC	2	47	191873	CAP-END	1
16989	ELBOW	1	48	161874	O-RING	1
89440	HOSE-TO TEE	1	49	187436	SPRING	1
16542	CONNECTOR	1	50	.....	PISTON	1
16587	LOCKNUT	1	51	16165	ELBOW-HOSE TO TEE	1
16485	O-RING	1	52	157532	HOSE	1
126121	HOSE-TO STEERING CONTROL	1	53	141908	ELBOW-45 DEGREE	1
15343	BUSHING	1	53	16487	O-RING	1
17775	NIPPLE	1	54	16882	ELBOW	1
16588	LOCKNUT	1	55	.....	TEE-SPECIAL, SEE 2A05	1
16486	O-RING	1	55	REF. 32		1
127045	CLAMP	4	56	.....	PUMP-STEERING, 2007	1
169130	HOSE-TO TEE	1				
177459	ELBOW					
16587	LOCKNUT					

*FOR TRUCKS WITHOUT HORN.

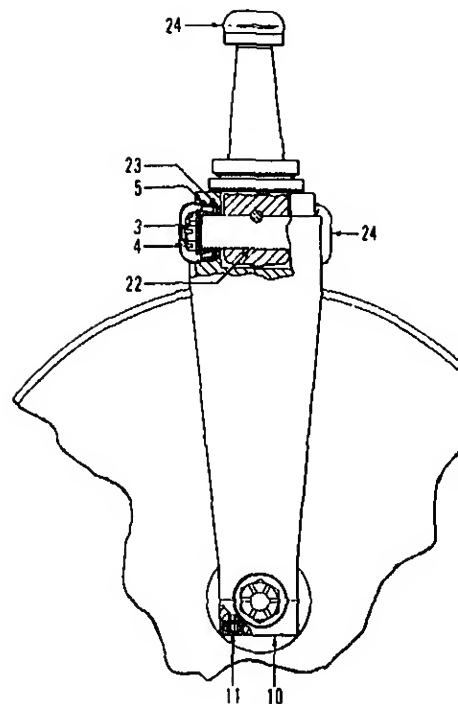
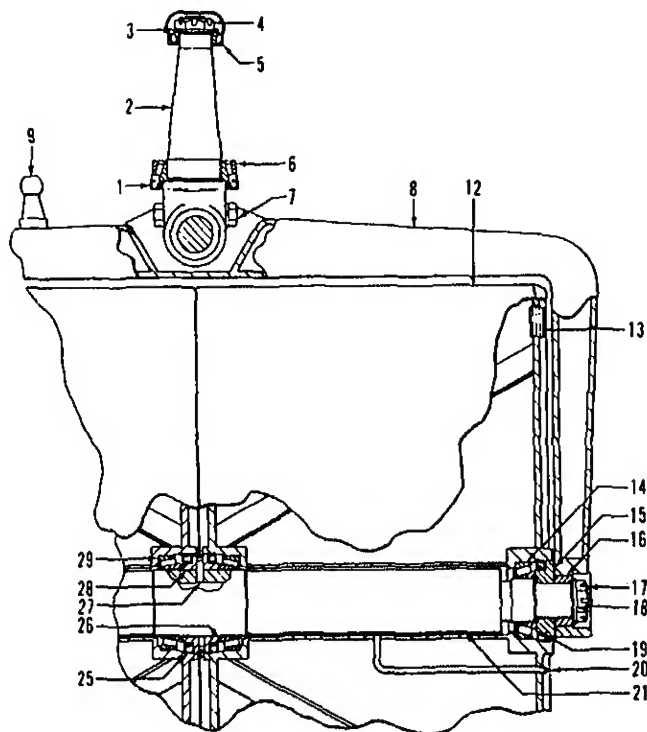
STEERING CONTROL



HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.	REF. NO.	HYSTER PART NO.	NAME OF PART 1 2 3 4	QTY.
163616	CONTROL-STEERING	1	21	189586	BALL-STEEL, 1/4	1
241103	CONTROL	1	22	158843	SEAT-CHECK	1
158826	CAPSCREW	7	23	158844	PLUG-SEAL	1
158827	CAP-END	1	24	158845	O-RING	1
158828	GEAR SFT	2	25	165316	COLUMN-STEERING	1
158829	SPLINE	1	25	165317	TUBE AND FLANGE	1
158830	SPACER	1	26	165318	SHAFT	1
138907	SPACER	1	27	159764	SNAP RING	2
158831	PLATE	1	28	159703	BEARING	1
158832	DRIVE	1	29	138145	RING-RETAINING	1
138145	CAPSCREW	4	30	159812	CAPSCREW-3/8 UNC X 3/4	2
158833	CAP-HOUSING	1	31	165201	TERMINAL AND WIRE	1
158834	SEAL-OTL	1	32	194851	INSULATOR-CONTACT	1
158835	SEAL-QUAD RING	1	33	165203	SPRING-CONTACT	1
158836	BUSHING-CAP LOCATER	1	34	165204	WASHER-CONTACT	1
198028	RACE-BEARING	2	35	194847	RING-CONTACT	1
198029	LOCATOR-BEARING	1	36	194846	INSULATOR-CONTACT RING	1
209627	NEEDLE BEARING-THRUST	1	37	241102	KIT-HORN BRUSH	1
158837	O-RING	1	38	16606	SCREW	2
.....	HOUSING-VALVE	1	39	165314	TERMINAL-WIRE	1
.....	SLEEVE AND SPOOL	1	40	165313	CONNECTOR	1
158839	PIN-CENTERING	1	41	161865	NUT-13/16 NEF	1
158846	PIN-DISC	2				
158840	SPRING-CENTERING	6				
158841	SPRING	1				

*INCLUDED IN SEAL KIT 158847.

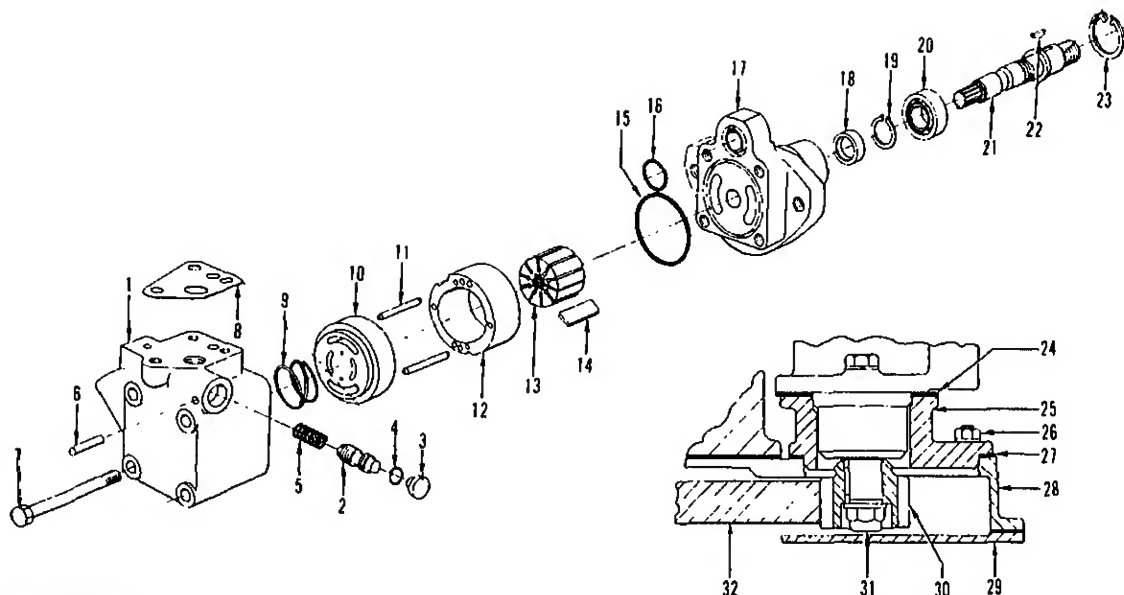
*INCLUDED IN CONTROL PARTS KIT 189585.



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	156220	SEAL-OIL	1
2	391352	PIN-KING	1
3	192427	WASHER	5
4	193006	NUT-JAM	3
5	15250	COTTER-3/16 X 3	3
6	230324	CUP-BEARING	3
7	230325	CONE-BEARING	3
8	230389	CUP-BEARING	1
9	230390	CONE-BEARING	1
10	18667	CAPSCREW-1/8 UNC X 2 1/4	2
11	15166	WASHER-1	2
12	390084	YOKE-STEERING	1
13	390122	STUD-BALL	1
14	.....	CAP	2
15	187238	CAPSCREW-5/8 UNF X 2 1/2	4
16	390088	DRUM-STEERING	2
17	15316	PLUG	2
18	15320	PLUG	2
19	390104	CONE-BEARING	2
20	390105	CUP-BEARING	2
21	390107	SPACER	2
22	390108	SPACER	2

REF. NO.	HYSTER PART NO.	NAME OF PART
17	193006	NUT-JAM
18	15250	COTTER-3/16 X 3
19	191412	WASHER
20	390106	SEAL-OIL
21	16007	FITTING-LUBE
22	390096	SHAFT-AXLE
23	391351	PIN
24	156223	SEAL-OIL
25	156224	CAP
26	44525	SEAL-OIL
27	390101	SHIM
28	390102	SHIM
29	390103	SHIM
30	19960	PIN-1/2 X 1 3/4
31	390099	SPACER
32	97623	CONE-BEARING
33	97626	CUP-BEARING

~~FIRST USED ON G/H 8096 9155-6 A1166-15~~
~~LAST USED ON G/H 8096 9154-6 A1166-150~~
~~FIRST USED ON SERIAL NUMBER 8096 9001~~
~~USED ON 6340A ONLY.~~

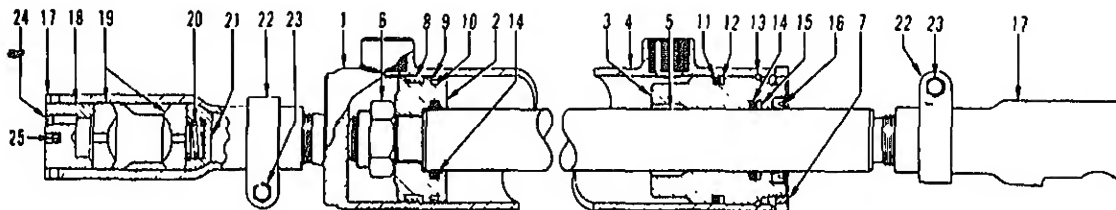


KEY
A-FOR GAS ENGINE.
B-FOR 4-236 DIESEL ENGINE.

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	
			A	B
	191756	PUMP-STEERING	1	..
	191757	PUMP-STEERING	..	1
1	192327	COVER	1	1
2	147990	VALVE-CONTROL	1	1
3	192326	PLUG	1	1
4	* 176037	O-RING	1	1
5	236024	SPRING	1	1
6	236026	PIN	1	1
7	133820	CAPSCREW	4	4
8	* 119963	GASKET	1	1
9	96952	SPRING	1	..
9	155056	SPRING	..	1
10	133816	PLATE-PRESSURE	1	1
11	54767	PIN	2	..
11	236011	PIN	..	2
12	159064	KIT-CARTRIDGE	1	..
12	133817	KIT-CARTRIDGE	..	1
12	192319	RING	1	..
12	164525	RING	..	1
13	147528	ROTOR	1	..
13	164526	ROTOR	..	1
14	147527	KIT-VANE, 10 VANES	1	..
14	236012	KIT-VANE	..	1
15	* 176038	O-RING	1	1
16	* 176039	O-RING	1	1
17	.....	BODY	1	1

REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.	
			A	B
18	* 176040	SEAL-OIL	1	1
19	169009	SNAP RING	1	1
20	97847	BEARING	1	1
21	97846	SHAFT	1	1
22	236018	KEY	1	1
23	97850	SNAP RING	1	1
24	982161	GASKET-STEERING PUMP TO DRIVE ADAPTER	..	1
24	168889	ADAPTER-STEERING PUMP	..	1
26	983271	STUD-ADAPTER TO TIMING GEAR HOUSING	..	4
26	15005	NUT-5/16 UNF	..	4
26	15155	WASHER-SPRING, 5/16	..	4
27	168890	GASKET-ADAPTER TO TIMING GEAR HOUSING	..	1
28	.....	HOUSING-TIMING GEAR, 1C03	..	1
28	.....	REF. 30	..	1
29	.....	COVER-TIMING GEAR HOUSING, 1C03 REF. 2	..	1
29	168887	GEAR-STEERING PUMP	..	1
31	983331	NUT-STEERING PUMP RETAINING	..	1
31	992633	WASHER	..	1
32	.....	GEAR-IDLER, 1C03 REF. 26	..	1

*INCLUDED IN SEAL KIT 133821.



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
1	157873	STEERING CYLINDER	1
1	390663	STEERING CYLINDER	1
2	162065	PISTON	1
3	162066	BEARING	1
4	162067	BARREL	1
5	162068	ROD-PISTON	1
5	223640	ROD-PISTON	1
6	162069	LOCKNUT	1
7	162070	NUT-BEARING	1
8	162073	RING-WEAR	1
9	162076	RING-PISTON	1
10	162074	O-RING	1
11	57664	O-RING	1
12	162075	RING-BACK UP	1
13	165615	RING-LOCK	1
14	79974	O-RING	2
15	155105	RING-BACK UP	1

REF. NO.	HYSTER PART NO.	NAME OF PART
16	162072	SEAL-WIPER
17	390124	SOCKET
17	157823	SOCKET-BALL
18	133535	PLUG-ADJUSTMENT
20	132546	SPRING
21	132547	SEAT-SPRING
22	14122 A	CLAMP
23	15517	CAPSCREW-1/2 UNF X 2-1/4
23	15158	LOCKWASHER-1/2
23	15008	NUT-1/2 UNF
24	15483	PLUG
25	15284	COTTER-1/4 X 3 1/2

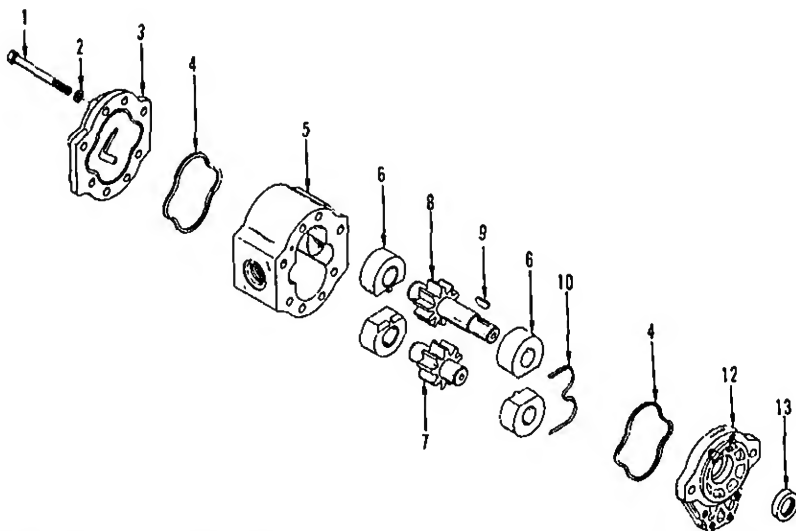
*INCLUDED IN SEAL KIT 223641.

*FIRST USED ON SERIAL NUMBER 8896-3001

*FIRST USED ON SERIAL NO. 8896-3105.

STEERING PUMP

FOR 3-53 DIESEL ENGINE



REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
	169150	PUMP-STEERING	1
1	129446	CAPSCREW	6
2	129447	WASHER	6
3	170078	COVER-REAR	1
4	168941	GASKET-SEAL	2
5	.....	BODY	1
6	168947	BEARING	4
7	984513	GEAR-DRIVEN	1
8	.....	GEAR-DRIVE	1

REF. NO.	HYSTER PART NO.	NAME OF PART
10	155806	GASKET-SEAL
12	158908	COVER-FRONT
13	235933	SEAL-SHAFT
	129445	KIT-MAJOR
	158913	KIT-MINOR
	129444	KIT-GEAR

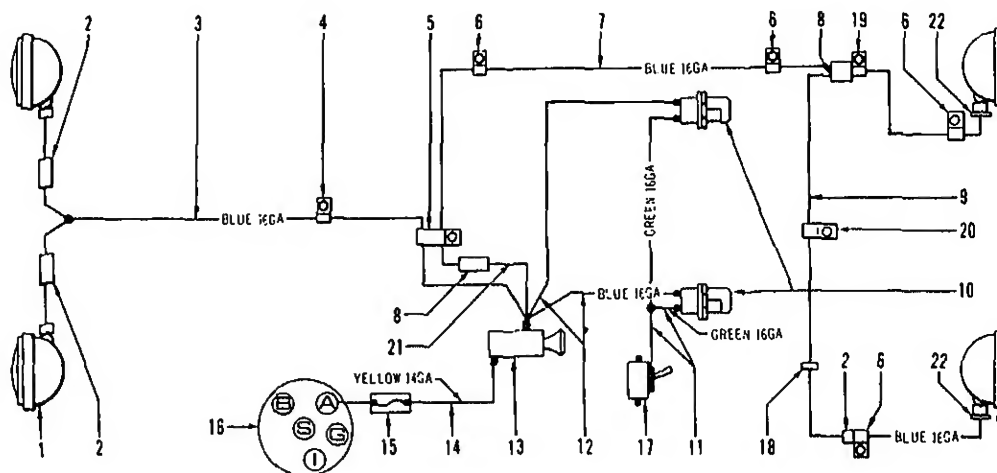
*INCLUDED IN MAJOR KIT.

*INCLUDED IN MINOR KIT.

OPTIONAL EQUIPMENT

LIGHTING SYSTEM ZE03





REF. NO.	HYSTER PART NO.	NAME OF PART	QTY.
	159563	LIGHTING GROUP	1
1	139646	HEAD LIGHT	4
1	156776	ELEMENT-SEALED BEAM	1
1	149519	RETAINER-ELEMENT	1
1	156777	SHELL	1
1	149513	BUSHING-PIVOT	1
1	149514	WASHER	1
1	149516	NUT	1
2	42958	CONNECTOR-FEMALE	3
3	159566	WIRE-FRONT LIGHTS	1
4	124359	CLAMP	1
5	132131	CLAMP	1
6	132131	CLAMP	4
6	15913	LOCKWASHER-5/16	4
6	15055	NUT-5/16 UNC	4
7	159567	WIRE-REAR LIGHTS	1
8	73510	CONNECTOR-FEMALE, 2 TO 1 WIRE	2
9	159568	WIRE-REAR LIGHT TO CONNECTOR	1
10	159565	LIGHT-PANEL	2

REF. NO.	HYSTER PART NO.	NAME OF PART
10	182677	BULB-12 VOLT.
10	164301	LENS
10	164302	BASE
11	159570	WIRE-PANEL LIGHT GR
12	159569	WIRE-SWITCH TO PANE
13	62886	SWITCH-LIGHT
14	60416 A	WIRE-FUSED
15	21778	FUSE-20 AMP.
16	.....	SWITCH-IGNITION AND S
16	.....	REF. 29 AND 1F05 RE
17	....	SWITCH-TOGGLE, 1F03 R
17	....	AND 1F05 REF. 16
18	107173	GROMMET
19	124359	CLAMP
20	124359	CLAMP
20	15913	LOCKWASHER-5/16
20	15055	NUT-5/16 UNC
21	166197	WIRE-LIGHT SWITCH TO
22	16637	WASHER-0.562

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15057	1B09	11	15687	1A05	22	16637	2E03	22	17324	2A06	51	21110	2C03	34
15058	1A05	21	15788	1B07	16	16644	1C05	21	17345	2A06	45	21162	1C07	2
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15086	1D08	44	15880	2A12	40	16663	1B09	6	17408	2D03	23	21420	1A05	28
15106	2A09	16	15905	1D11	8	16691	1A06	14	17419	2A09	11	21778	2E03	15
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PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.
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44322	2B07	6	87393	1A05	27	99623	1C01	14	122348	1D13	47	131119	1F04	2
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PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.
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	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.
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77	1807	7	160378	1806	70	161407	1813	10	161533	1814	14	162728	1F04	13	162728	1F04	13
78	1807	10	160379	1806	70	161409	1813	26	161535	1E01	37	162730	1F04	13	162730	1F04	13
82	1807	8	160381	1804	66	161411	1813	39	161536	1E01	39	162731	1F04	17	162731	1F04	17
50	1814	17	160382	1804	67	161412	1813	43	161537	1E01	41	162732	1F04	20	162732	1F04	20
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27	2004	2	160600	1803	10	161418	1813	1	161540	1012	8	162768	1804	30	162768	1804	30
28	2004	3	160601	1803	10	161419	1813	2	161543	1012	16	162772	1806	3	162772	1806	3
29	2004	4	160602	1803	10	161420	1813	4	161544	1012	17	162773	1806	13	162773	1806	13
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31	2004	7	160604	1803	9	161423	1813	44	161546	1012	19	162775	1804	67	162775	1804	67
32	2004	8	160622	1E03	7	161424	1C02	15	161548	1012	33	163202	1803	3	163202	1803	3
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62	1804	47	161403	1813	17	161529	1E01		162544	1013	36	164128	2A06	18	164128	2A06	18
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PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE	REF NO.	PART NO.	PAGE
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164156	1811	16	165882	1E04	11	166845	1F07	24	168941	2D07	4	169942	1806
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164188	1003	28	165890	1E04	26	167009	1F07	13	169092	1D05	2	169947	2D03
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164227	2A06	40	165898	1E04	36	167056	1C04	18	169100	1D05	5	170079	1C02
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165786	2C03	49	166655	1F07	27	168892	1C03	1	169776	1F04	41	172812	1F08
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175347	1003	33	181366	2D04	31	186227	2A08	24	190589	2B03	15	190655	2B04
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176038	2006	15	181774	1D11	26	186304	1F03	29	190593	2A12	18	190731	1F03
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197068	2A06	69	213628	2A06	1	219923	2A11	31	229897	1E02	3	236012	2D06	14
197549	1B10	20	213683	1B10		219924	2A11	35	229898	1E02	5	236018	2D06	22
197551	1B10	2	213684	1B03	1	219925	2A11	32	229899	1E02	8	236024	2D06	5
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199398	1A07	20	213693	1B06	5	219933	2A11	26	230504	2A14	65	236075	1F07	44
199400	1A07	4	213694	1B06	5	219934	2A11	24	230505	2A14	66	236078	1F08	51
199401	1A07	26	213695	1B06	5	219936	2A11	22	230506	2A14	67	236081	1F08	53
199562	2A09	17	213696	1B06	5	219937	2A11	21	230507	2A14	68	236082	1F08	54
199839	1B10		213697	1B06	33	219938	2A13	7	230508	2A14	58	237011	2B02	20
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199933	1D03	36	213700	1B06	70	219941	2A11	17	230511	2A13	2	239995	2B08	44
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204121	1A05	16	213889	2A09	27	219946	2A11	11	230516	2A14	43	242166	2B01	33
204223	1F04	42	213892	1D07	8	219948	2A14	91	230517	2A13	22	242361	1B04	55
204773	2C03	1	213894	1D10	16	219949	2A14	85	230518	2A14	56	243165	2A11	33
204966	2C03	2	213896	2A09	21	219950	2A14	81	230519	2A14	49	243166	2A14	80
205127	1C07	15	213897	2A10	6	219951	2A14	86	230520	2A14	51	243167	2A14	65
205698	2A08	72	213898	2A09	30	219952	2A14	87	230521	2A14	37	243575	2B01	18
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210616	2C03	22	215011	2A09	7	221573	2B08	60	230528	2A13	34	243582	2B01	29
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213621	2A06	30	219918	2A11	9	229880	1E01	37	234719	1D05	8	243605	2B01	34
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NO.	PAGE	NO.	NO.	PAGE	NO.	NO.	PAGE	NO.	NO.	PAGE	NO.	NO.	PAGE	NO.	NO.	PAGE	NO.
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[illegible]

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25B, Organizational requirements for Roller, Vibratory, Selfpropelled.

U.S. GOVERNMENT PRINTING OFFICE : 1988 O - 201-4

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
 1 Kilometer = 1000 Meters = 0.621 Miles

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
 1 Kilogram = 1000 Grams = 2.2 Lb.
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

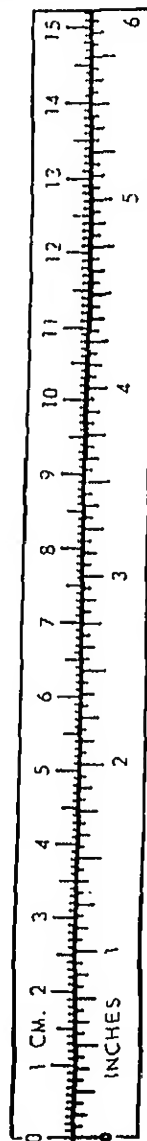
TEMPERATURE

59° (0° F - 32°) = 0°C
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 9/5 C° + 32 = F°

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



TA089991